United States Department of Agriculture

Forest Service

Southwestern Region

Environmental Assessment for the Gallinas Municipal Watershed Wildland-Urban Interface Project

Santa Fe National Forest

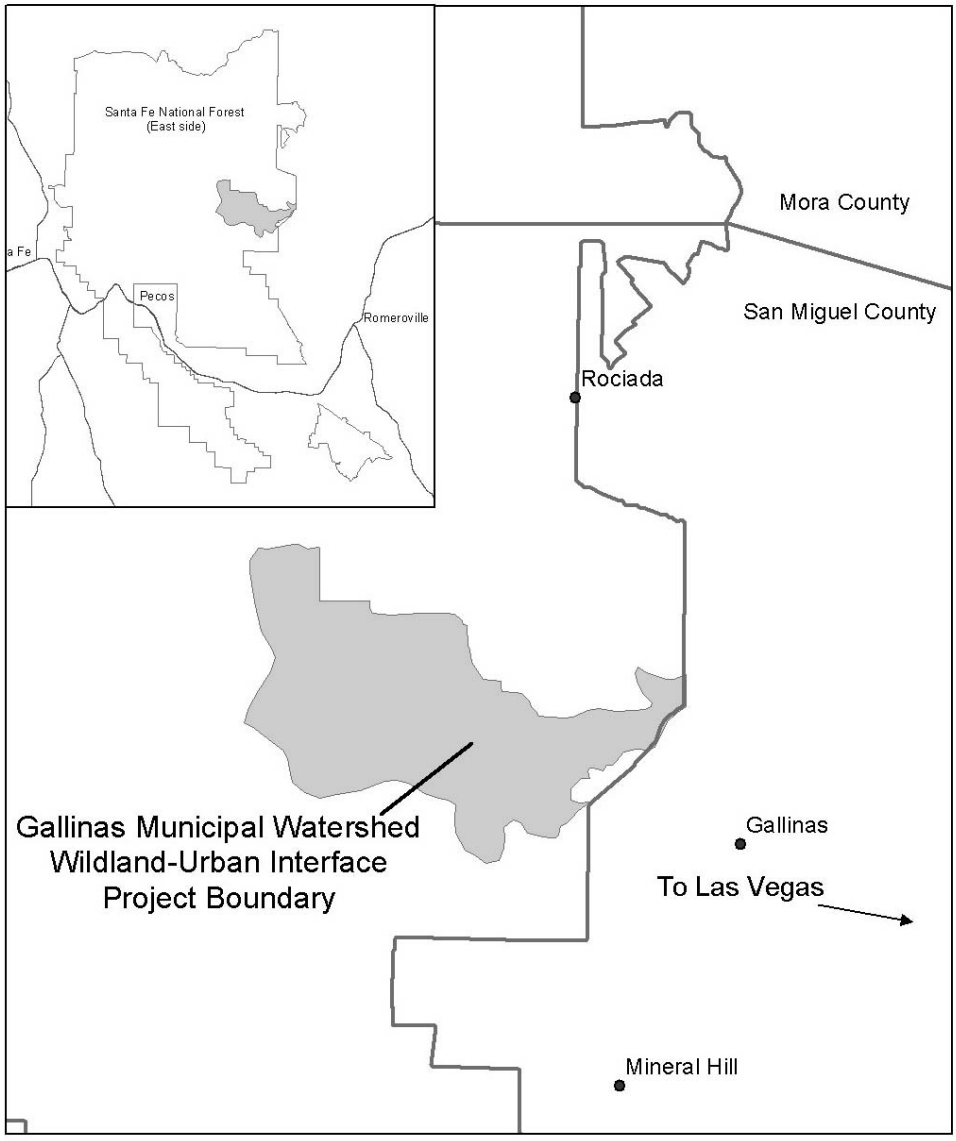

Figure 1. Location of the Gallinas Municipal Watershed Wildland-Urban Interface project boundary.

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Chapter 1 – Purpose and Need

Purpose and Need

The purpose of this project is to reduce the potential for large-scale, high-intensity crown fire initiation and spread in the Gallinas Municipal Watershed during 90th percentile weather conditions[1]. As such, treated stands need to:

- Have flame lengths of 4 feet or less;
- Have a torching index[2] greater than 35 miles per hour; and
- Not support active crown fire[3].

To achieve these objectives, the project area needs fewer small trees, less brush and downed wood, and a more open forest canopy.

In addition, this project would enhance scenery along Forest Road 263, Forest Road 156, and from Johnson Mesa by opening up views to Hermit's Peak and the plains beyond Las Vegas, promoting aspen, and diversifying the spacing and sizes of trees.

This project responds to the Santa Fe National Forest Plan's standards and guidelines that govern the protection of soil and water (pp. 75-80), wildlife and fish (pp. 61-66), old growth forest (pp. 68-69A), scenery (pp. 56-58), and heritage resources (pp. 58-61); all are hereby incorporated by reference. Since these resources would be damaged or destroyed in a high-severity wildfire, this project would better protect them by reducing the chance that such a fire would occur. This project also conforms to the area specific direction for Management Areas J and C.

The bulk of the project lies within Management Area J, which emphasizes water quality maintenance or enhancement and sustained water yield. Relevant standards and guidelines are (pp. 139-142):

Prohibited

- Road construction, except for temporary access to implement vegetation management activities or to support special uses

Allowable

- Timber harvest to limit the potential of catastrophic fire and to promote long-term watershed health
- Prescribed fire to reduce fuels to an acceptable level while protecting watershed values
- Fire line construction that minimizes disturbance to soil and water

In addition, the standards and guidelines for Management Area J incorporate the Gallinas River Watershed Natural Resource Plan (1994), created jointly by the Forest Service, City of Las Vegas, and Tierra y Montes Soil and Water Conservation District.

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[1] Percentile weather measures weather severity, such as dryness and windiness. The higher the percentile, the more likely it is that weather conditions will support a wildfire.

[2] Torching index is the wind speed required to cause a fire to climb up and burn the crowns of individual or small groups of tress.

[3] An active crown fire runs through the crowns of trees and is coupled with a surface fire.

The southern portion of the project area (around Johnson Mesa) is in Management Area C (Forest Plan, pp. 106-111), which emphasizes visual quality and developed recreation while protecting wildlife habitat and riparian zones. It permits timber harvest where consistent with the primary emphasis of this area. Management Area H (wilderness) bounds the project area to the north.

This project also responds to the National Fire Plan's goals of reducing hazardous fuels, restoring fire-adapted ecosystems, and improving fire prevention and suppression (USDA Forest Service 2000 (p. 9), USDA & USDI 2001 (p. 1) USDA & USDI 2002 (p.5)). The National Fire Plan lists three "condition classes," defined by tree species, forest density, and missed fire frequencies (see photos below). The National Fire Plan also places special emphasis on conserving priority watersheds such as the Gallinas.

Figure 4. Example of Condition Class 3, Santa Fe National Forest, 2000.

Figure 2. Example of Condition Class 1, Santa Fe National Forest, 2000.

Figure 3. Example of Condition Class 2, Ruidoso, New Mexico, 2000.

Background

About 17,000 people in the city of Las Vegas, New Mexico and surrounding villages depend on Gallinas Creek for their water. Gallinas Creek feeds the Peterson, Bradner, and Storrie Lake reservoirs, providing the only source of municipal water currently available to residents. The watershed is an 84-square mile mosaic of national forest, private, and other public lands; National Forest System lands comprise about one-third of the watershed (51 square miles or 32,000 acres). The project area is approximately 17,100 acres in size and consists of ponderosa pine forest (about 2,400 acres), mixed conifer forest (about 9,100 acres), and spruce-fir forest (about 5,600 acres) (see Figure 5 below).

Ponderosa pine and mixed conifer forests in the watershed have changed greatly due to a lack of forest fires. Throughout the 1900s the Forest Service aggressively suppressed wildfires, eliminating the beneficial, low-intensity surface fires that played a key role in maintaining healthy ponderosa pine and mixed conifer forests. The watershed has had no major fires for the better part of a century, except in 2000, when the Viveash Fire (28,000 acres total) burned about 1,500 acres of the watershed.

Scientific research consistently shows that ponderosa pine forests today are more susceptible to high-severity crown fires due to past fire suppression (Covington and Moore 1994, Arno and others 1995 and 1997, Graham and others 1999, Scott 1998, Pollet and Omi 2002). This research demonstrates that ponderosa pine forests used to contain stands of mostly large ponderosa pine trees. Frequent surface fires thinned out the smallest pine and fir trees, leaving an average of 20 to 80 large ponderosa pine trees per acre. The surface fires seldom killed the large, mature pine trees, and they opened forest canopies, created a clumpy distribution of large pine trees, and encouraged grass and shrubs.

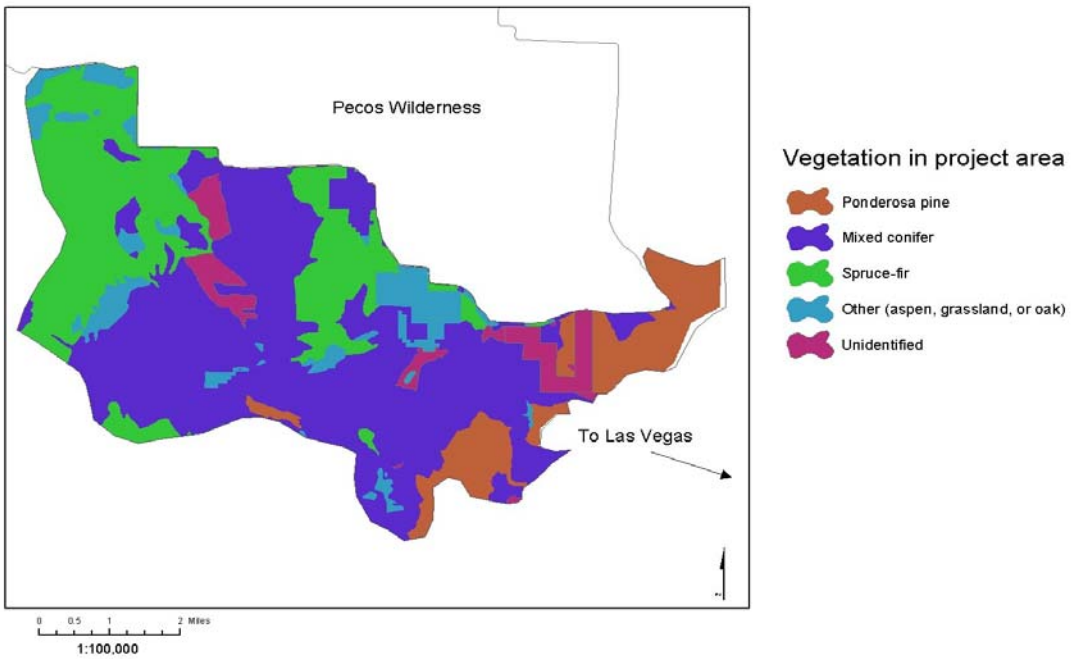

Figure 5. Vegetative cover types in the project area.

Ponderosa pine forests in the project area today are very dense, averaging 700 to 1,000 trees per acre (project record). Many of the young trees are shade-tolerant fir trees, which will eventually overtop the pines if no fires occur (Arno 1983, Laacke 1990). The majority of the trees are small (less than 16 inches in diameter), leaving relatively few large, fire-resistant pine trees. The trees are so crowded that their growth is suppressed, and the heavy shading they provide has eliminated most of the herbaceous vegetation on the forest floor.

Figure 6. Example of old-growth ponderosa pine stand, Bitterroot National Forest, circa 1908.

Mixed conifer forests in the watershed are similarly dense, averaging 800 to 1,000 stems per acre (project record). Frequent, low-intensity surface fires are as important to the maintenance of uneven-aged mixed conifer forests in New Mexico as they are to ponderosa pine (Arno 2000, Cooper 1960, Fule and others 1997, Swetnam and others 1996). Some mixed conifer stands are still within their natural range of fire occurrence ("fire regime"); however, the majority is not (condition class map, project record).

The dense understory of shade-tolerant fir trees in ponderosa and mixed conifer stands is highly susceptible to mortality by fire. These thickets of smaller trees act as "ladder fuels" that quickly carry a surface fire up into the crowns of the taller trees. These ladder fuels, together with the large expanses of closed-canopy forest, create the conditions for a fast-spreading, uncontrollable, high-intensity crown fire.

The Viveash Fire serves as an example of what the conditions in the watershed could render (see photos, next page). The Viveash Fire burned in the Cow Creek drainage, just west of the watershed. It burned approximately 29,000 acres in three days; 48 percent of the area was a severe burn, where all the trees and vegetation were killed. Sediment and ash from this fire showed up in the Las Vegas municipal water treatment works approximately 22 miles downstream. The sediment and ash affected the City's ability to provide quality water to its citizens (R. Tafoya, pers. comm.). A fire of Viveash's magnitude occurring in the Gallinas Watershed would be disastrous for Las Vegas' water quality.

Firefighters' response time to a fire in the watershed would be slow, ranging from 2 to 5 hours because Forest Road 263 is the only access to the heart of the watershed (T. Gonzales, pers. comm.). Because Forest Road 263 is the only way in or out of Gallinas Canyon, evacuation would be slow and dangerous.

For these reasons, the Gallinas Municipal Watershed WUI project is urgently needed to reduce potential wildfire severity in the watershed. Thinning-from-below combined with prescribed burning has been found to be a very effective treatment in reducing wildfire severity (Agee 1996, Agee and others 2000, Biswell 1960, Canton-Thompson and Silvieus 1999, Edminster and Olsen 1995, Fiedler and others 1997, Graham and others 1999, Harrington and Arno 1999).

Figure 7. A spruce-fir stand after the Viveash Fire (July 2000).

Figure 8. Flooding in Cow Creek after the Viveash Fire (July 2000).

Desired Future Condition

The Forest Service's interdisciplinary team (ID team) describes the desired future condition as follows:

> There would be an average of 45 to 160 trees per acre, with fewer trees along the dominant ridge tops (shaded fuelbreaks). The vast majority of the trees would be greater than 12 inches in diameter, with a smaller amount (15-20 percent) of trees less than six inches in diameter. This would approximate Condition Class 1. The understory would be primarily ponderosa pine and Douglas-fir. Aspen would be encouraged. The canopy closure would average 40 percent, providing sufficient openings to slow the spread of a crown fire. The predominant fuel models would be 8 and 9, surface fuel models with low flame heights. Wildfires would primarily travel on the surface, with limited torching of individual or small groups of trees. An abundance of snags and downed logs would be present. Spacing between trees would be varied and irregular, and some clumps of trees with interlocking crowns would be left intact. Tree densities would be higher on north- and east-facing slopes and in the bottom of drainages. There would be more grass than there is now. Watershed conditions would support small-scale, low-intensity surface fires rather than large, uncontrollable crown fires. By thinning along Forest Road 156, desirable views to Hermit's Peak and beyond would be opened up.

Refer to the fire and vegetation specialist's reports and ID team meeting notes in the project record for the development of the desired future condition.

Figure 9. Example of desired condition about 1 year after treatment, Lincoln National Forest, 2000.

Proposed Action

The Forest Service proposes to meet the purpose and need by thinning and/or prescribed burning about 8,400 acres of the watershed. The existing road system would be used; no new roads would be built. The project is tentatively scheduled to start in the spring or summer of 2004, and would be implemented in stages over 5 to 10 years, treating 500 to 1,000 acres per year. The Forest Service would:

- Thin from below in mixed conifer and ponderosa pine forest. Most of the ponderosa pine stands are located on the eastern side of the watershed, running from the forest boundary to the El Porvenir Christian Camp. The mixed conifer forest is centrally located, from the El Cielo Ranch to the headwaters of Gallinas, Wolf, Bitter, and Calf Creeks.

- Create shaded fuelbreaks by thinning to a lower density along certain ridge tops and Forest Road 156 (Johnson Mesa Road).

- Open areas accessible by existing roads and on gentle terrain, such as Johnson Mesa and northeast of El Porvenir Campground, for public collection of wood products. The public would not be permitted to collect wood from around private property or summer homes; in this case, the Forest Service would offer small thinning contracts.

- Dispose of slash by piling and burning, chipping, and/or broadcast burning. No broadcast burning would be conducted near private property (such as Calf Canyon, the El Porvenir Christian Camp, the Harvey Ranch and others).

- Conduct a series of broadcast burns. Low intensity broadcast burns would be used to reduce the density of remaining small trees and surface fuels across the treatment areas.

- Maintain or improve about 11 miles of existing system roads by blading the surface of the roads and removing brush from the edges.

Chapter 2 of this Environmental Assessment (EA) has a detailed description of the Proposed Action as well as specific mitigation measures and monitoring.

Decision to be Made

The District Ranger will decide whether or not to implement the proposed action or another alternative that meets the purpose and need, or whether an environmental impact statement is needed before making that decision.

Public Involvement and Scoping

The Forest Service collaborated closely with the City of Las Vegas in the preparation of this proposal. We also invited the public to participate at several stages of the process. Highlights of the public participation process include:

- Listing the project on the Santa Fe National Forest's Schedule of Proposed Actions as of November 2001 (www.fs.fed.us/r3/sfe).
- Mailing two notices that provided information and sought public comment, the first in May 2001 and the second in August 2001. The mailing list consisted of about 280 names, including Federal and State agencies, Native American tribes, municipal offices, businesses, special interest groups, and individuals. The Forest Service received a total of 26 written responses to the notices.
- Public meetings were held in May 2001 and August 2001 to introduce the project, present the proposed action, and discuss local concerns and interests that should be addressed in the analysis. About 30 people attended the first meeting, and about 10 people attended the second meeting. The meetings generated almost 50 comments about the proposed action.
- The Forest Service met on a regular basis with the Gallinas Watershed Technical Management Group, which is comprised of the City of Las Vegas, San Miguel County, the State of New Mexico Forestry Division, the Office of the State Engineer, the New Mexico Environment Department Surface Water Quality Bureau, the Fish and Wildlife Service, and others. The technical group provided the Forest Service with valuable insight and helped finesse the proposed action before its presentation to the public.
- Announcements about the project were printed in the Santa Fe New Mexican. Press releases were forwarded to the Las Vegas Optic.
- Met with homeowners in Calf Canyon (September 2, 2001) to present the project and answer questions.
- Presented the project at a Las Vegas City Council meeting (May 8, 2001).
- Presented the project at a San Miguel County Commissioner's meeting (July 11, 2001).
- Met with New Mexico Wilderness Alliance on September 17, 2001 to go over the proposed action in detail and solicit comments.

- Invited the City of Las Vegas to attend a prescribed burn on the Pecos/Las Vegas Ranger District (October 2002).

Key Issues

Key issues are concerns about the potential effects of a proposed action. The ID team identified the key issues for this project based on internal and public comments. The ID team used key issues to design project alternatives and mitigation measures that would limit adverse effects. This section lists the key issues analyzed in detail in Chapter 3, along with a few other non-key issues that are required to be included in an environmental analysis. Where appropriate, we combined similar issues into one issue statement.

Key Issue 1: Water Quality

Using ground-based harvesting equipment, creating skid trails, and blading road surfaces compacts and exposes soil. Compacted and/or exposed soil is more likely to erode; some soil could erode into nearby streams (sedimentation). Sedimentation degrades water quality.

Evaluation criteria: The amount of soil predicted to move (erosion) and the amount predicted to reach streams (sedimentation) above acceptable soil loss rates (Forest Plan, p. 76) will be estimated in tons per acre per year. Water quality will be evaluated by the State of New Mexico's Water Quality Standard (WQCC 2002, 20.6.4.12(A)).

Key Issue 2: Air Quality/Smoke

Prescribed burning, especially broadcast burning, produces smoke. Under certain atmospheric conditions, the smoke could settle in areas where people live, work, or recreate. The smoke could cause respiratory problems for some people, and also create a safety hazard by limiting visibility.

Evaluation criteria: Particulate matter emissions in tons. Smoke is comprised of various gases and particulate emissions. Particulate emissions limit visibility and aggravate respiratory conditions in susceptible individuals. Over 90 percent of particulate emissions from prescribed burning are 10 microns (PM-10) or less in diameter, so estimating the amount of particulate emissions will give an indication of how severe smoke effects might be.

Key Issue 3: Potential for Escaped Fire

Prescribed burns may escape control measures and threaten the water supply and resources in and around the watershed. Burning in unthinned stands may pose the highest risk of fire escape.

Evaluation criteria: The number of acres to be broadcast burned without prior thinning. Stands that are burned without prior treatment are most likely to escape control measures.

Issues Eliminated from Detailed Study

The ID team determined that some concerns were outside the scope of the proposal, conjectural, or already decided by law or regulation. Issues eliminated from this analysis are summarized below.

Those issues considered to be outside the scope of the project are:

- *The water yield for the City of Las Vegas could be greatly increased if the spruce-fir in the upper elevation of the watershed was treated.* The purpose of this project is to change expected fire behavior, not to increase water yield. A water yield project would require that Las Vegas improve its treatment works and increase the storage capacity of its reservoirs. Further, there is considerable controversy about the effectiveness of water yield projects (Schmidt and Wellman 1999).
- *The project should provide economic development, such as training programs and summer jobs for students.* Economic development opportunities are better provided through grants from other agencies, such as the State of New Mexico or other nonprofit organizations.
- *Re-seed project areas with native grasses that will attract elk to reduce depredation complaints.* The Forest Service does not receive depredation complaints in this area. The proposed prescribed burning would encourage native grasses without re-seeding.
- *Slow the traffic down on Forest Road 263.* The purpose of this project is to reduce the risk of a large crown fire. Traffic management may be necessary when people are collecting forest products; however, no fundamental changes to the road system would be necessary to implement this project.
- *Re-introduce beaver to the project area.* Wildlife populations and re-introductions are managed by the U.S. Fish & Wildlife Service and the New Mexico Department of Game & Fish.
- *Put some logs into Gallinas Creek to improve fish habitat.* The project's purpose is to reduce the risk of a large crown fire, not to improve fish habitat.
- *Encourage ATV use on selected routes.* Road management and ATV use is assessed through the watershed-level roads analysis process rather than at the project level. Encouraging ATV use does not address the purpose and need for this project.
- *Reduce nonnative vegetation to restore native habitats.* Management of nonnative vegetation is being addressed in a forest-wide environmental impact statement, and is not an action needed to meet the purpose of this particular project.
- *Reduce road density to minimize disturbance to wildlife.* This project does not change the status of any existing forest system roads; therefore, a roads analysis process is not required.
- *If temporary roads are built, they will continue to be used by all-terrain vehicles and more and more people will use the forest.* The original proposal was modified to eliminate construction of temporary roads.

Those issues already decided by law, regulation, Forest Plan, or other higher level decision are:

- *The Forest Service needs to thin on more than one watershed to make a difference.* This issue is being addressed at a national level via the National Fire Plan, and at the forest level through individual thinning projects on each district.
- *Build a loop road from Gallinas Creek to Burro Canyon.* This part of the project area lies largely within an inventoried roadless area. Although the Forest Service is allowed to construct roads in an inventoried roadless area for fuels reduction projects with permission from the Chief of the Forest Service, we chose not to do so for this

project. New road construction would cause sedimentation, possibly impairing the city's water quality.

- *This project is not a wildland-urban interface project because there are no communities in the project area.* The National Fire Plan (USDA Forest Service, 2000) clearly states that "readily accessible municipal watersheds" are high priorities for fuels reduction treatments. Region 3 of the Forest Service defines the wildland-urban interface as:

  > *"WUI includes those areas of resident populations at imminent risk from wildfire, and human developments having special significance. These areas may include critical communications sites,* ***municipal watersheds****, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved." (emphasis added) (Forest Service Manual 5140, R3 Supplement No. 5100-2000-2)*

The project area encompasses a power line, several developed recreation sites and trails, and about 2,100 acres of private land, including a church camp, two ranches, and about 20 summer homes in Gallinas Canyon. Finally, the Gallinas Watershed is designated as a "Wildland-Urban Interface Community within the Vicinity of Federal Lands that are at High Risk from Wildfire" in the Federal Register notice of January 4, 2001.

The following issue will not be discussed further because the effects associated with it are quite limited in extent, duration, and intensity:

- *Additional vehicles traveling in the project area to collect wood products could cause congestion or safety hazards on Forest Road 263, which is narrow and curvy in places.* The number of trucks expected on Forest Road 263 would be 1 or 2 an hour for approximately six months (project record) stretched over the life of the project (5 to 10 years). In other words, extra vehicles would be on the road intermittently. Forest Road 263 is lightly traveled even during summer months, so additional vehicles from the project would not be expected to create safety hazards.

Project Record Availability

Additional documentation may be found in the project record located at the Pecos/Las Vegas Ranger District of the Santa Fe National Forest. The project record is available for public review during normal business hours. Please contact Julie True at (505) 757-6121 for more information.

Chapter 2 - Alternatives

Introduction

Based upon the comments received during scoping, the ID team developed alternatives to address key issues. Some alternatives developed by the ID team or suggested by the public were eliminated from detailed study and possible selection, while others were rigorously explored in this environmental assessment. The ID team collaborated with the City of Las Vegas in developing Alternative 3.

Alternatives Considered but Eliminated from Detailed Study

After preliminary analysis, the ID team eliminated nine alternatives from detailed study. These alternatives were not reasonably feasible and/or did not address the purpose and need. Alternatives eliminated from further study are briefly summarized below.

Treat spruce-fir stands. Treating spruce-fir would entail building roads to remove the wood in order to alleviate the risk of an insect epidemic. Construction of new roads causes sedimentation, which impairs water quality. Because this is a municipal watershed, the Forest Service's utmost goal is to maintain or enhance water quality (Forest Plan, p. 139). Further, the spruce-fir in the watershed is within its natural range of variability for fire (150-200 years).

Construct new roads to increase access to more of the Watershed and to remove more wood. Road construction can be detrimental to water quality because it can cause sedimentation. This project is located in a municipal watershed; the ID team chose not to risk jeopardizing water quality. Further, part of the watershed is located in inventoried roadless areas. There is considerable public concern about the loss of roadless areas. The ID team believes that the Proposed Action would be effective without new road construction.

Do not cut any trees and use only prescribed burning to reduce the amount of forest fuels. Prescribed fire has occasionally been used to thin dense stands, and can be used effectively to reduce trees three inches or less in diameter. However, much of the project area consists of continuous, multi-storied, dense stands on steep slopes. It is our professional judgment that using prescribed fire alone cannot be safely implemented without first reducing tree densities in strategic areas. Two studies near Flagstaff, Arizona, clearly demonstrate that prescribed fire alone cannot eliminate enough fuel to reduce the risk of catastrophic, stand-replacing fires (Sackett and others 1996).

Thin only trees measuring 16 inches or less in diameter. We eliminated this alternative because it would not meet the purpose and need. There are some situations where removing select larger trees would be necessary. For example, if white fir trees over 16 inches in diameter were overtopping an old-growth ponderosa pine stand, it would be desirable to remove the white fir and leave the ponderosa pine trees. In some cases, large trees that could survive surface fires may be eliminated by a self-propagated crown fire (Hollenstein and others, 2001).

Construct helicopter landings north of Terrell Ranch and at Calf Canyon. Neither of these locations lends themselves easily to helicopter landings. The terrain around Calf Canyon is steep, and helicopter landing areas need to be flat. Construction of a landing north of Terrell Ranch would not be effective unless there was a road to it to remove wood. The ID team decided not to propose new roads as described above.

Treat the area just south of the Gallinas Watershed, in the Tecolote Watershed, along existing roads. The Forest Service plans on analyzing the Tecolote watershed for a fuels reduction project in the future.

Treat only around structures and private land (pursuant to Cohen 2000). We eliminated this alternative because it would not meet the purpose and need. Creating fuelbreaks around private property only might protect private property, but not reduce the risk of a large, high-severity crown fire elsewhere in the watershed.

Treat without using any heavy equipment, such as forwarders and feller-bunchers. In some areas, treatments would not be effective without the use of modern equipment.

Implement a "restoration only" alternative. The purpose of this project is to change expected wildfire behavior under certain weather conditions; restoring an ecosystem is a distinctly different objective. In some forest types, such as ponderosa pine, changing fire behavior can be synonymous with restoring the stand to its historical fire regime. This is not true for all forest types, such as spruce-fir or some mixed conifer.

Alternatives Considered in Detail

In addition to the alternatives considered then dropped from further study, the ID team analyzed three action alternatives and the No Action Alternative. Each action alternative meets the purpose and need to some degree by reducing the number of small trees and creating openings in the forest canopy. Each alternative is consistent with the Forest Plan for the Mexican spotted owl (Appendix D, pp. 1 – 6) and the northern goshawk (Appendix D, pp. 6-10). Large maps of the alternatives are located in the project record.

Alternative 1 - No Action

In the No Action Alternative, the Forest Service would not remove any trees, brush, or downed wood in the watershed. Other routine and ongoing management activities, however, would continue as they do at present. The No Action Alternative does not meet the purpose and need of the project; it would not change expected wildfire behavior in the Watershed. The No Action Alternative would not move the project area towards the desired condition, and it would have the highest probability for a large, high-severity crown fire.

We evaluated the No Action Alternative in two ways. When considered as "no change" from the existing condition, the No Action Alternative provides a baseline against which other alternatives may be compared.

The second way we evaluated the No Action Alternative assumes that an 11,000-acre, high-severity crown fire would occur in this area

Alternative 2 - Proposed Action

The Proposed Action would treat about 8,400 acres. Figure 10 shows the location of the areas proposed for treatment, and Table 1 summarizes the actions. A detailed description of the proposed treatments follows.

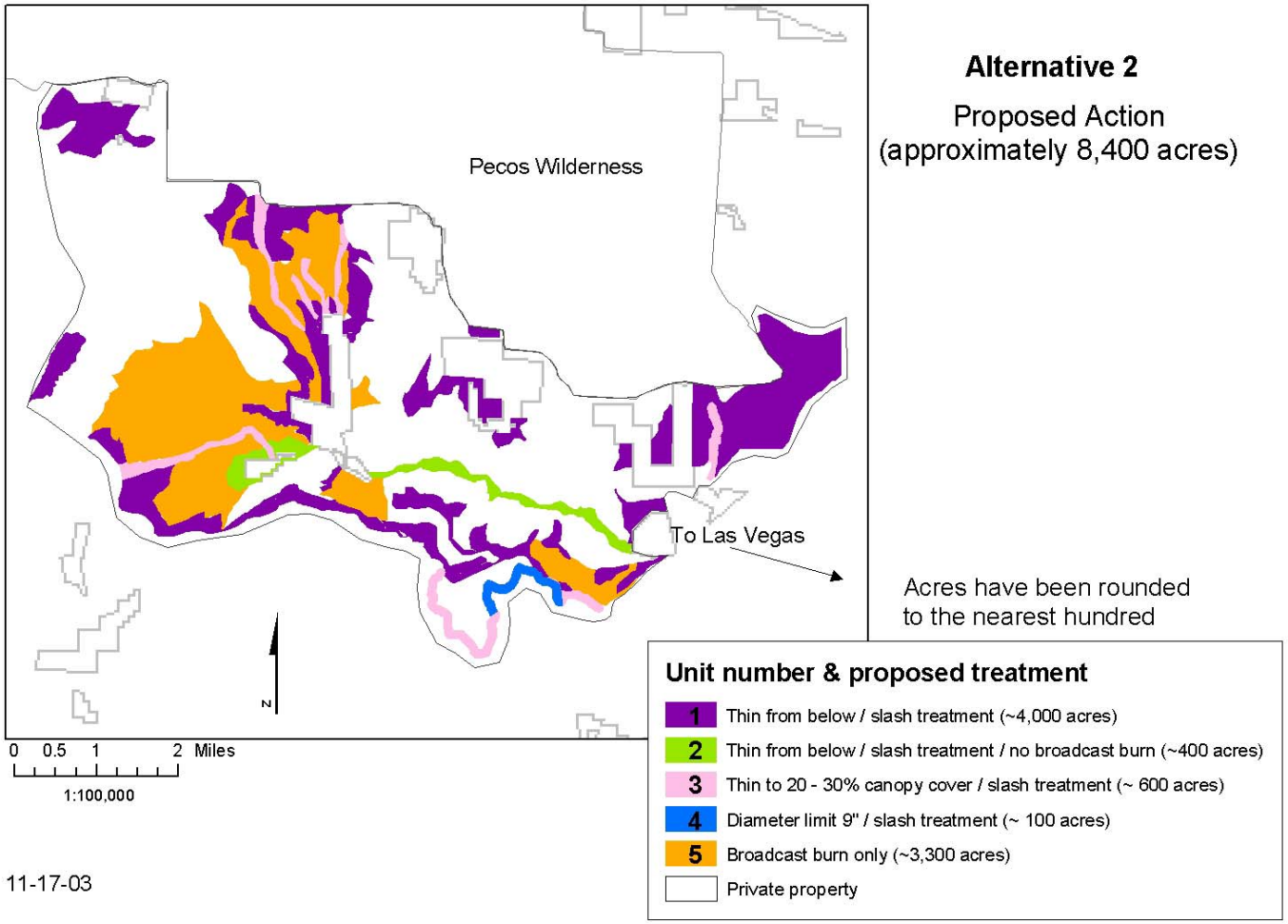

Figure 10. Location and proposed treatment areas under Alternative 2 (Proposed Action).

Table 1. Summary of actions under Alternative 2 (Proposed Action). Acres have been rounded to the nearest hundred.

Unit Number	Acres	Thin from below	Shaded fuelbreak	Remove encroaching conifers from meadows	Thin from below with 9 inch diameter limit	Collect forest products	Pile and burn slash	Chip slash	Lop and scatter slash	Broadcast burn
1	4,000	x		x		x	x		x	x
2	400	x				x	x	x		
3	600		x			x	x		x	x
4	100				x	x	x		x	x
5	3,300									x
Total =	**8,400**	**acres**								

Part of the proposed treatment area (about 4,000 acres or 48 percent) is located in inventoried roadless areas (IRA) (see Figure 11). In the IRA, the Forest Service proposes to thin small diameter trees and broadcast burn to reduce the risk of uncharacteristic wildfire and its effects. This type of activity is authorized in an inventoried roadless area under Interim Directive FSM 7710-2003-1 effective from June 12, 2003 through December 12, 2004. The Proposed Action would not change the roadless character of the area because no roads would be built in it, the natural integrity of the area would remain unchanged at the end of treatments, and the opportunity for solitude and primitive recreation would remain unchanged.

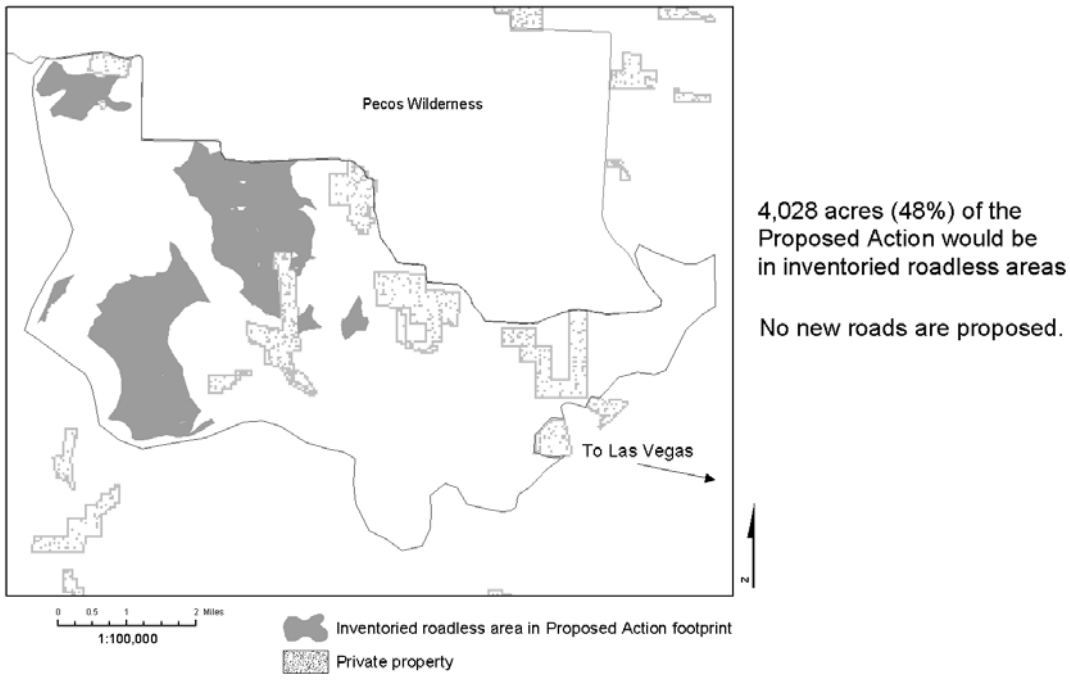

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Figure 11. Inventoried roadless areas proposed for treatment under Alternative 2 (Proposed Action).

Roads

The Proposed Action would use the existing Forest Service system of roads and trails, including those closed to the public and used intermittently for administrative purposes (Figure 12). No new roads would be constructed, no existing roads would be reconstructed or re-routed, and we would not change the maintenance levels of any existing roads; therefore, a roads analysis process is not required (FSM 7712.13). Existing roads would be maintained to provide safe access to the project area. About ten miles of existing roads would need to be improved by blading and removing brush from the edges. About one mile of a previously decommissioned road now used as a trail (the Na-Na-Ka Trail), would be temporarily re-opened for administrative use only (no public access) and closed immediately after project completion.

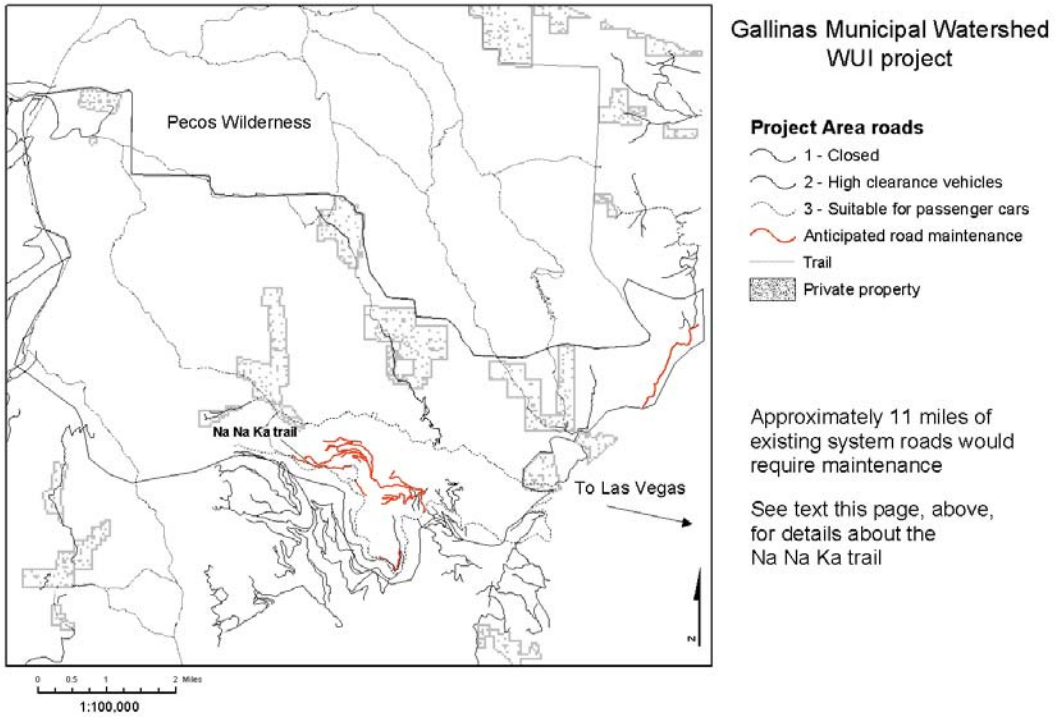

Figure 12. Roads in the project area, including those anticipated to need maintenance.

Thin from Below

The canopy cover in areas targeted for thinning would be reduced to an average of 40 percent. Unthinned patches would be scattered throughout the stands to mimic natural disturbance patterns. The Forest Service would retain about 15 to 25 of the largest mature trees on each acre. Along with these, the Forest Service would leave other medium to large immature trees, for a total of 50 to 100 of the largest trees per acre. The size of "medium" and "large" trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. For example, if the largest trees in a stand were 10 inches in diameter, those would be left and the smaller ones cut.

Across the project area, most trees cut would be six inches or less in diameter, since these are most abundant. Fewer trees in the 6- to 12-inch diameter range would be cut, even fewer in the 12- to 16-inch diameter range, and almost none above 16 inches. Only a few situations would warrant cutting a larger tree. For example, trees dying from disease or insect infestation are more flammable and could pose a greater fire threat to an otherwise healthy stand. Trees greater than 16 inches in diameter would be removed only when necessary to meet a fuel reduction or wildfire behavior objective.

The Proposed Action meets Forest Plan standards and guidelines for old growth because no old growth stands or potential old growth stands have been proposed for treatment (silviculturalist's report, project record).

The actual number of trees left per acre to meet fuel reduction objectives would depend on the existing number of trees, stand structure, canopy cover, slope, aspect, site productivity, and other factors affecting fire behavior. The spatial distribution of trees should vary, having enough space between the crowns of individual trees or small groups of trees to slow a crown fire. Varying the spatial distribution of trees would also improve scenic aspects of the forest. The silviculturalist's report on vegetation contains more detail on tree spacing, stand density indices, diameter distributions, crown-to-base heights, and crown bulk densities as they relate to fire. The viewshed corridor plan identifies specific areas that should be made into views overlooking unique features, such as aspen stands, rocky outcrops, or Hermit's Peak.

Figure 13. Thinning from below, Pecos/Las Vegas Ranger District, January 2002.

Most of the small trees cut would be white fir and Douglas-fir. Thinning, however, would not eliminate any species. In the spruce-fir, the Forest Service would cut encroaching conifers, sapling- or pole-sized, from natural meadows and stands of aspen.

Thinning would be accomplished by a combination of hand crews and modern equipment, such as the masticating machine used in the Santa Fe Watershed. Where system roads exist, such as along Gallinas Canyon, around Calf Canyon, and on Johnson Mesa, modern ground-based harvesting equipment would be used to thin and remove wood. Ground-based harvesting equipment would be the most effective way to reach the material, and these machines are much lighter on the land than conventional harvesting equipment used in the past.

Thinning would incorporate restoration principles, such as using the existing forest structure, implementing multiple conservative treatments, using the least disruptive thinning methods, and retaining trees of significant size or age (Allen and others 2002).

Wood Removal

Felled trees would be removed from an estimated total of about 2,000 acres. Some of the thinned areas would be opened to the public to collect small wood products, such as firewood and latillas. These are the acres of gentle terrain along existing roads. Areas along Gallinas Canyon and around Calf Canyon would be thinned by the Forest Service or a contractor and not opened to the public due to safety reasons (refer to the Social Environment section in Chapter 3 for more details). About 500 acres of spruce-fir forest would be opened to the public to remove dead and down wood only.

Removing some of the wood would reduce the total surface fuel load while providing a valuable commodity to the local community. Removing wood products is only feasible, however, on gentle slopes, and the vast majority of the project area is too steep, rugged, and far from roads to facilitate removal.

Thinning and subsequent slash treatment (described in the next section) would be completed over 5 to 10 years.

The acres of thinning and dead and down would yield a total of about 26,500 cords of firewood (or 5,300 cords annually for five years). Assuming that wood could be removed 120 days per year, removing this volume of wood would require approximately 45 pickup truck loads per day during working months. The report on traffic analysis contains more details.

Slash Treatment

Slash (cut tree tops, branches, and boles) would be disposed of in one of three ways—burning it in piles, lopping and scattering it, or chipping and removing it. On gentle slopes near private property, slash piles would be built and subsequently burned. If the terrain near private property is too steep for building piles, the slash may be chipped. Instead of chipping, the slash could also be compacted into bales and hauled away. Away from private property, the slash may also be "lopped" (cut up into pieces), scattered within a site at a depth of 24 inches or less, and left to dry for subsequent burning.

Since road access is very limited in this project area, most of the thinned material would have to be burned in piles or broadcast burned. Where slash is piled, it would be left to dry and then burned to reduce the fuel load to acceptable levels (approximately 60 percent or more fuel consumption of the slash). Broadcast burning would release nutrients into the soil and promote regeneration of grasses and other plants, restoring ecological processes for fire-adapted organisms.

Scattering the slash may be needed in some areas to carry a low-intensity surface burn. The cut and scatter slash option may be selected at sites where lower burn temperatures are needed to protect a sensitive soil type, or to minimize the visual impacts of the burn near recreation sites and trails, or where the thick duff layer needs to be burned to provide an adequate soil bed for the growth of grass.

Figure 14. Lopped and scattered slash, Pecos/Las Vegas Ranger District, January 2002.

Figure 15. Piles of slash drying prior to being burned, Santa Fe Watershed.

Fuelbreaks

Figure 16. Burning piles of slash, Santa Fe Watershed November 2003.

Several shaded fuelbreaks would be strategically located along ridge lines and roads. To minimize impacts on scenic views, the fuelbreaks would not have straight or defined lines and would imitate the form and pattern of existing openings. The edges would be feathered to blend into the surrounding untreated areas.

The fuelbreaks would be thinned to a canopy cover of 20 to 30 percent, except in one place. A portion of the proposed fuelbreak on Forest Road 156 crosses a Mexican Spotted Owl Protected Activity Center. In this section, only trees less than nine inches in diameter would be thinned in accordance with the Forest Plan (Appendix D, p. 3). In the rest of the fuelbreak, most of the understory would be removed, leaving the largest trees. We anticipate leaving about 20 to 40 of the largest trees per acre in the fuelbreaks. For the fuelbreaks to be effective in inhibiting the spread of a crown fire, thinning must create sufficient spacing between tree crowns and reduce the crown bulk density. Creating shaded fuelbreaks would most likely require harvesting trees, rather than just thinning.

After thinning and slash treatment, a prescribed burn would clear away additional surface fuels and vegetation. The actual width of the fuelbreaks would vary between 200 and 600 feet.

The mixed conifer and ponderosa pine stands containing fuelbreaks would adhere to the goshawk guidelines for canopy cover (Forest Plan, Appendix D, p. 9).

Broadcast Burning

Some areas are too steep for thinning and slash piling. These areas would be burned at a low intensity[4] to reduce surface and ladder fuels. Some of the thinned areas may also be broadcast burned, which could result in additional tree mortality of up to 10 percent.

Burn units would be approximately 100 to 800 acres, depending on the terrain, the amount of fuel, and the stand structure. Units would be designed to keep the fires on the surface and not to exceed smoke standards. They would be carefully defined on the ground and described in a detailed, site-specific burn plan, which undergoes several levels of review. Unthinned stands that are included in a burn unit would be surrounded by fire lines, thinned stands without slash, and/or fuelbreaks. Broadcast burning would take place after thinning is complete, over a 5 to 10-year time period.

[4] Low intensity burns generally have flame lengths of less than 4 feet; consume primarily surface fuels: needles, twigs, and woody material less than about 2-inch diameter; and partially consume the duff layer, rotten wood, seedling and small saplings, with minimal heating of mineral soil.

Various ignition techniques and patterns would be used, depending on the site. Often, surface fuels will be manually ignited at the top of a ridge such that the fire burns slowly down the slope. With any type of ignition, ground crews would be used to monitor, contain and "mop-up" the burn (inspect and extinguish embers after the flames have diminished).

The number of units that could be burned each year would depend on weather, fuel moisture, and other factors. Depending upon weather and fuel moistures, broadcast burning would likely occur fewer than 10 days per year. Broadcast burning is most likely to occur during the fall, following the rainy season in July and August.

Figure 17. Lighting a broadcast burn with a drip torch. Photo courtesy of the Bureau of Land Management, 2001 (above).

After treatments are complete and trees are growing back (10 to 20 years from now), maintenance burns would reduce the number of seedlings and maintain the desired condition. However, burns desired in the distant future are too speculative to analyze as part of this proposal. Long-term monitoring of fuel loads would guide decisions about future burns.

Figure 18. A broadcast burn on the Pecos/Las Vegas Ranger District, October 2001. Notice that the fire is mostly on the ground (right).

Project Size and Timing of Treatments

The acreage proposed for treatment totals approximately 8,400 acres, considered the highest priority areas that can feasibly be treated within the next 10 years. It constitutes much of the accessible forested area in the watershed that lies outside the Pecos Wilderness. Treatments would begin on the east side of the project area, along Gallinas Canyon, around Calf Canyon, and around Johnson Mesa.

There are several reasons why it would require 5 to 10 years to complete this project. First, felling trees, cutting off branches and tops, and piling slash on steep, rugged terrain would require approximately three people per acre per day. We would need at least 30 workers thinning and treating slash on 10 acres per day to treat the maximum projected acreage of 500 to 1,000 acres per year; it is unlikely that work would take place year-round. Second, the slash must dry before it can be burned, and weather conditions must be suitably cold and moist for slash burning. Some extremely dense stands (over 1,000 stems per acre) would likely require two separate thinnings to avoid having too much slash to safely burn at one time. Third, the amount of slash that can be

burned at one time is limited by the weather and amount of smoke production expected. Last, we must wait for specific weather and fuel moisture conditions to conduct safe, low intensity burns.

Thinning and slash disposal would probably occur in several different parts of the project area concurrently in order to accomplish project objectives within a decade. In addition, thinning crews would be separated in different parts of the project area in order to avoid having too many areas covered with dry slash at any one time.

Alternative 3 — More Thinning

The ID team developed Alternative 3 as a way to address the issues of risk of escaped fire and water quality at the headwaters of Gallinas Creek.

The Proposed Action suggests broadcast burning without prior thinning in mixed conifer located around Gallinas Creek, Bitter Creek, Wolf Creek, and Calf Creek. Burning without pretreatment in this area could be risky or ineffective. A cool burn might not be entirely effective, and a hotter burn might escape and cause detriment to water quality. Thus, the ID team, in conjunction with the City of Las Vegas Water Department, developed Alternative 3. It proposed to bolster fire protection to the south by creating a wider fuelbreak, since prevailing winds tend to be from the south-southwest.

About 47 percent (approximately 4,100 acres) of Alternative 3's treatment area is located in inventoried roadless areas (see Figure 20). As with Alternative 2 (Proposed Action), the proposed treatments comply with Interim Directive FSM 7710-2003-1 effective from June 12, 2003 through December 12, 2004 because only small diameter timber would be removed. Alternative 3 would not change the roadless character of the area because no roads would be built in it, the natural integrity of the area would remain unchanged at the end of treatments, and the opportunity for solitude and primitive recreation would remain unchanged.

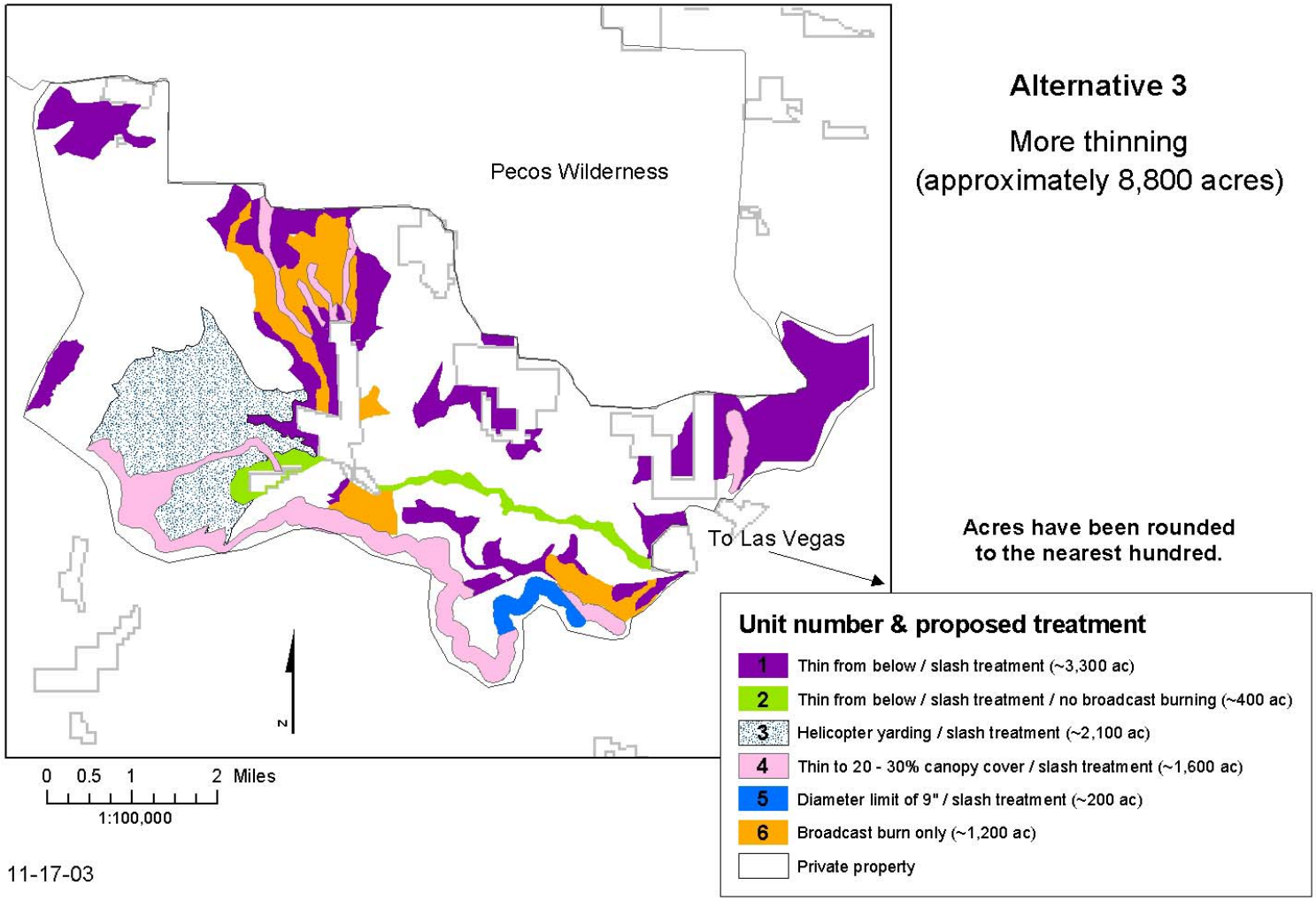

Figure 19. Location and proposed treatment areas under Alternative 3 (More Thinning).

Table 2. Summary of actions under Alternative 3 (More Thinning). Acres have been rounded to the nearest hundred.

Unit Number	Acres	Thin from below	Shaded fuelbreak	Remove encroaching conifers from meadows	Thin from below with 9 inch diameter limit	Helicopter yarding	Collect forest products	Pile and burn slash	Chip slash	Lop and scatter slash	Broadcast burn
1	3,300	x		x			x	x		x	x
2	400	x					x	x	x		
3	2,100	x				x		x		x	x
4	1,600		x			x	x	x		x	x
5	200				x		x	x			x
6	1,200										x
Total =	**8,800 acres**										

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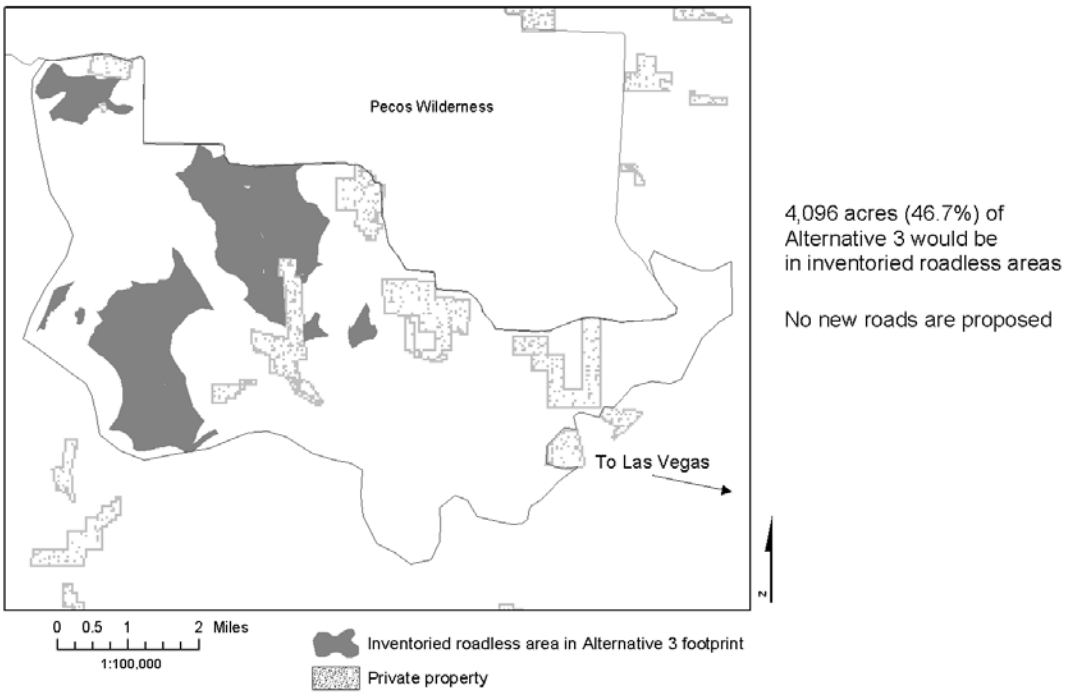

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Figure 20. Inventoried roadless areas proposed for treatment under Alternative 3 (More Thinning).

Actions that would be the same under Alternative 3 as described in the Proposed Action are: roads; thin from below; slash treatment; broadcast burning; and project size and timing of treatments.

The actions described below would be different from the Proposed Action:

Fuelbreaks

Alternative 3's fuelbreaks differ from the Proposed Action in that they would be wider, 500 to 800 feet (versus 200 to 600 feet). The fuelbreaks would be wider because a helicopter would be used to remove wood from steeper slopes along Forest Road 156. By extending the fuelbreak, an additional 200 acres could be thinned.

Helicopter Yarding

Alternative 3 proposes using a helicopter to remove felled logs from certain parts of the watershed (see Figure 19). Felled trees would be flown out; small woody material would be left onsite. After yarding is complete, the slash would be either hand-piled and burned, or lopped, scattered and broadcast burned, depending upon specific site conditions. Areas targeted for helicopter yarding would be on slopes less than 55 percent. Helicopters use long cables suspended from the bottom to transport wood to landings.

Approximately 2,700 acres, located in the headwaters of Gallinas Creek and along Forest Road 156, would have wood removed by helicopter. The material removed would either be staged at landings along Forest Road 156 or at Gallinas Trailhead for easy removal. Landings would need to be at least one-half to one acre in size, but actual landing size would depend on how quickly the slash could be treated and hauled from the landing sites. The trees in the middle of Gallinas Trailhead and some on the uphill side would have to be cut to use this area as a landing. The trailhead would be closed during yarding operations for up to three months.

To keep the size of the landings small, wood would have to be hauled immediately from them. The wood would be stockpiled, processed, or hauled from these landings along Forest Road 156.

Wood Removal

Alternative 3 differs from the Proposed Action in the number of acres generating wood for removal. The amount of wood removed under Alternative 3 would increase substantially due to the use of helicopter yarding (described above). Small wood products (such as firewood or latillas) could be removed from about 4,400 acres that are accessible by existing roads.

It is important to note that the amount of terrain open to vehicles collecting wood would not differ from that of the Proposed Action. In Alternative 3, the helicopter would move wood to Forest Road 156 or the proposed landing at Gallinas Trailhead. All other travel management features would remain the same as in the Proposed Action.

The acres of thinning and dead and down would yield a total of about 61,600 cords of firewood (or 12,322 cords annually for 5 years). Assuming that wood could be removed 120 days per year, removing this volume of wood would require approximately 103 pickup truck loads per day during working months. The report on traffic analysis contains more details.

Alternative 4 – Less Thinning, Less Prescribed Burning

The ID team designed Alternative 4 to address the key issues of risk of escaped fire and smoke. This alternative greatly reduces the amount of broadcast burning, so the chance of escaped fire and the amount of smoke released during project activities would be relatively small. Alternative 4 would create a series of fuelbreaks on ridge tops and along certain roads. No treatments other than fuelbreaks would occur in the interior of the watershed.

About 31 percent (approximately 1,100 acres) of Alternative 4's treatment area is located in inventoried roadless areas (see Figure 22). As with Alternative 2 (Proposed Action), the proposed treatments comply with Interim Directive FSM 1925.04a section 2 (a) (2) because only small diameter timber would be removed. Alternative 4 would not change the roadless character of the area because no roads would be built in it, the natural integrity of the area would remain unchanged at the end of treatments, and the opportunity for solitude and primitive recreation would remain unchanged.

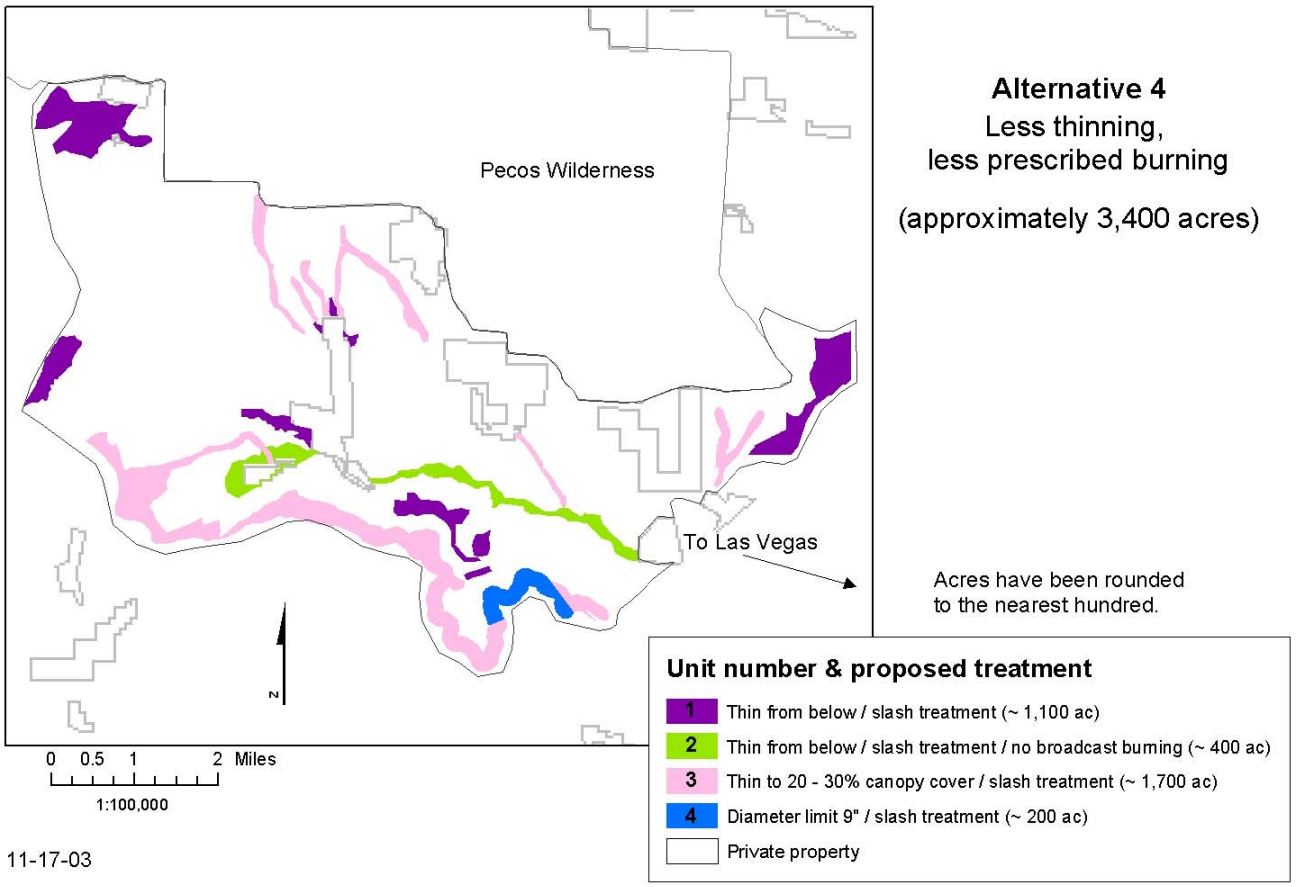


Figure 21. Location and proposed treatment areas under Alternative 4 (Less Thinning, Less Prescribed B

Table 3. Summary of actions under Alternative 4 (Less Thinning, Less Prescribed Burning). Acres have been rounded to the nearest hundred.

Unit Number	Acres	Thin from below	Shaded fuelbreaks	Remove encroaching conifers from meadows	Thin from below with 9 inch diameter limit	Collect forest products	Pile and burn slash	Chip slash	Lop and scatter slash	Broadcast burn
1	1,100	x		x		x	x		x	x
2	400	x				x	x	x		
3	1,700		x			x	x		x	x
4	200				x	x	x		x	x
Total =	**3,400 acres**									

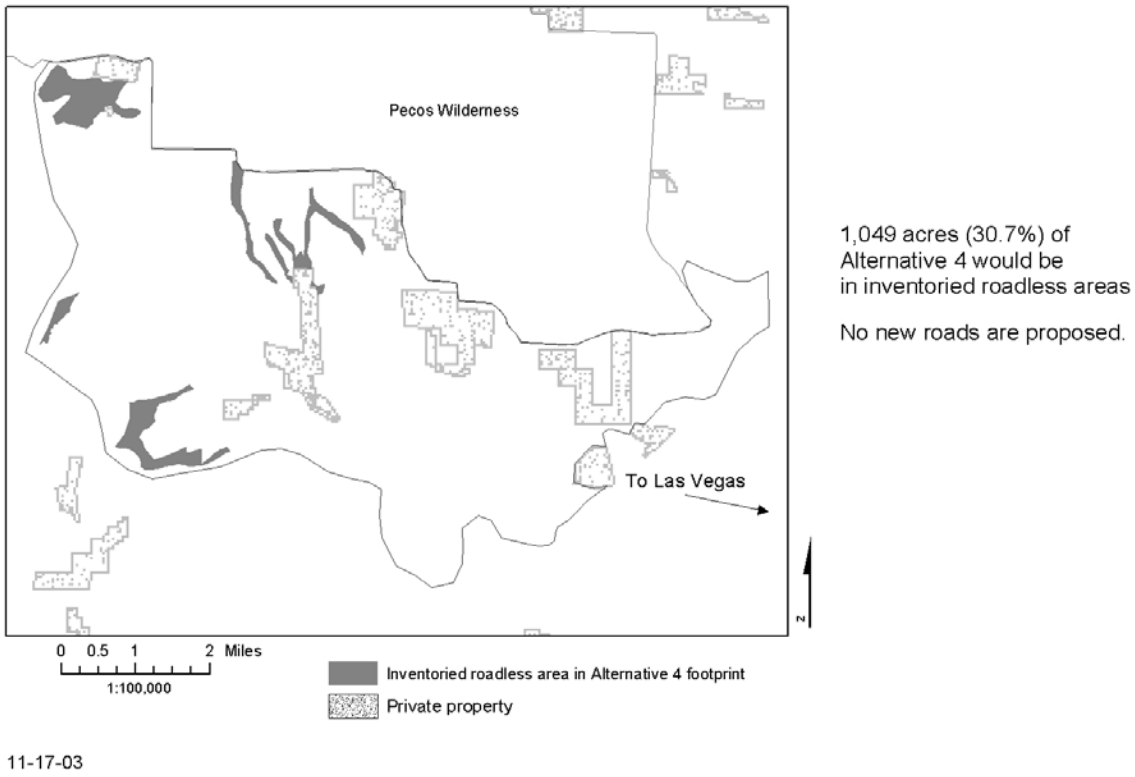


Figure 22. Inventoried roadless areas proposed for treatment under Alternative 4 (Less Thinning, Less Prescribed Burning).

Actions that would be the same in Alternative 4 as described in the Proposed Action are: No Road Construction; Thin from Below; Slash Treatment; Broadcast Burning.

The actions described below would be different from the Proposed Action:

Wood Removal

Small wood products (such as firewood or latillas) could be removed from about 2,100 acres that are accessible by existing roads.

It is important to note that the amount of terrain open to vehicles collecting wood would not differ from that of the Proposed Action.

The acres of thinning and dead and down would yield a total of about 27,000 cords of firewood (or 5,400 cords annually for five years). Assuming that wood could be removed 120 days per year, removing this volume of wood would require approximately 45 pickup truck loads per day during working months. The report on traffic analysis contains more details.

Fuelbreaks

Alternative 4 proposes to create three ridge top fuelbreaks in addition to those of the Proposed Action (see Figure 21).

The treatment method remains the same as for the other two alternatives. Where feasible along existing roads, the district would allow product removal. Multiple entries would be required to

complete the fuelbreaks located in the interior of the watershed; since tree boles cannot be removed from most of the area, they would have to be piled and burned.

Project Size and Timing of Treatments

Alternative 4 proposes to treat approximately 40 percent of the acreage of the Proposed Action. Therefore, the project would likely be completed in much less time, about 2 to 5 years.

Mitigation and Monitoring

The mitigation and monitoring measures contained in this section are common to all action alternatives unless otherwise noted. Mitigation measures are prescribed to avoid, minimize, or compensate for adverse environmental effects that may occur from project implementation. They were designed primarily to address issues listed in Chapter 1. Monitoring determines whether the treatments and mitigation measures were implemented as planned. Monitoring activities are indicated by an arrow.

Prescribed Burning and Risk of Escaped Fire

- All burning would be approved by the State of New Mexico, in compliance with its smoke management plan, to minimize the adverse effects on air quality.
- Exclude certain areas from the broadcast burn unit where, because of stand density or topography, there would be a risk of high-intensity fire behavior and escaped fire.

Soil and Water

Many of the following measures are derived from the Best Management Practices (BMPs) contained in Forest Service Handbook 2509.2 “Soil and Water Conservation Practices Handbook.”

- No ground-based heavy equipment would be used within 100 feet of a perennial stream or on riparian soils, whichever is greater (see map in Chapter 3). The riparian zone serves as a buffer, preventing sediment from entering streams.
- Designated skid trails and landings would be approved by the Forest Service prior to any harvesting to reduce the amount of exposed soil and compaction.
- After treatments are complete, skid trails will be seeded and mulched to reduce soil loss and subsequent sedimentation (Forest Plan, p. 110).
- Water bars and/or turnouts will be installed if needed to direct overland flow away from roads. Water bars and/or turnouts may also be installed if the project is temporarily shut down.
- Vehicles will not be permitted to travel on wet soils when tire tracks leave more than a 36-inch long track that is 12 inches deep or more. This will minimize erosion from road damage.
- Conventional, ground-based, heavy equipment is limited to slopes less than 40 percent (Forest Plan, p. 75).

Forest Vegetation

- ➢ Where there are large accumulations of pine slash over six inches in diameter, monitor down green logs in May or June to determine whether or not they are attracting *Ips* beetles. If so, adjust the timing of the thinning to occur after July 1st to limit mortality of living trees.

Wildlife and Terrestrial Habitat

- If any proposed, threatened, endangered, or sensitive plant or animal species is discovered during project implementation, stop work in the immediate vicinity of the species and consult with a biologist or botanist for appropriate protective measures.
- Establish 100-acre nesting centers in existing Mexican spotted owl PACs. No treatments whatsoever shall occur within this 100-acre area. (Forest Plan, Appendix D, p. 3)
- Do not allow thinning or burning within PACs (outside of the 100-acre nesting center) during MSO breeding season (March 1-August 31). (Forest Plan, Appendix D, p. 1; MSO Recovery Plan, p. 88)
- When burning in PACs, protect the 100-acre nesting center by constructing fire lines if natural fire lines do not exist. (Region 3 WUI programmatic, p. 55)
- Design burn plans to limit smoke occurring and settling in any PACs adjacent to the burn area. (Region 3 WUI programmatic, p. 56)
- Establish post-fledgling areas (PFAs) for any northern goshawk nesting areas discovered during surveys or project implementation. (Forest Plan, Appendix D, p. 6)
- Where consistent with fuel reduction objectives: in mixed conifer, retain at least five downed logs and 10 to 15 tons of woody debris per acre; in ponderosa pine, retain at least three downed logs and 5 to 7 tons of woody debris per acre. (Forest Plan, Appendix D, p. 9)
- Within one-quarter mile of perennial water (i.e., Gallinas Creek), leave two slash piles per acre, unburned and unchipped, as nest cover for wild turkey. These piles should be at least 3 feet high by 10 feet wide. (Forest Plan, p. 65)
- Where consistent with fuel management objectives, leave some piles of brush on north-facing slopes near water in mixed conifer to attract prey for the MSO (field meeting with U.S. Fish & Wildlife Service on 4-2-03).
- Seasonal restrictions on medium magnitude activities using machinery would be applied in peregrine falcon sensitive zones from March 1 to Aug 16 for the B-zone and March 1 to May 16 for the C-zone. These activities are permitted year-round in the D-zone. Helicopters arriving and leaving the work site would be routed around the sensitive zones according to seasonal restrictions in the site plan (USDA Forest Service et al 1991).

➢ Pre- and post-treatment microhabitat monitoring would be conducted in treated PACs as described in the Recovery Plan for the Mexican Spotted Owl (USDI 1995, pp. 106-107); and the Forest Plan standards and guidelines (Appendix D, pp.1, 3).

Scenery

- Meet VQO (visual quality objective) of retention in Management Area C and along Forest Road 263 in Management Area J.
- Dispose of activity-generated slash in the immediate foreground zone (within 300 feet of Forest Road 156 and 263 and all system trails) within one year of project completion (Forest Plan, p. 109).
- Created openings (i.e. landings) will not have linear openings in excess of 300 feet per mile along each side of sensitivity level 1 roads (Forest Roads 156 and 263) and trails. (Forest Plan, p. 110).
- Locate decks and landings outside the immediate foreground zone whenever feasible. Restore visible landings to original or characteristic contours and revegetate within one year of project completion (Forest Plan, p. 110).

- Feather and scallop edges of decks and landings to create a near natural appearance and to avoid visually strong edges (USDA Forest Service Handbook No. 559, p. 24).
- Where trees are cut near trails, camp and picnic sites, and cabins, stumps should be cut flush with the ground where feasible within 30 feet of the use area, as determined onsite by the landscape architect. Stumps from 30 feet to 100 feet of the use area should be cut no higher than six inches above ground. Cut faces should point away from the viewer. Consult with cabin owners, landscape architects, archeologists, and silviculturalists to select trees to leave and to cut near cabins.

Recreation

- Restore the Na-Na-Ka Trail to meet a trail class designation of "primitive" after project completion and do not thin within 50 feet of the trailhead to prevent motorized use of the trail.
- Do not cut blaze trees that mark trails.
- Using GIS, ensure that areas to be treated do not cross the boundary of the Pecos Wilderness.

Air Quality

Most of the following measures are derived from the USDA Forest Service NEPA Air Quality Analysis Desk Reference, 1995, and the EPA Prescribed Burning Background Document and Technical Information Document for Best Available Control Measures, 1992.

- Plan activities so that air quality will meet applicable Federal, State and local regulations, including protection of Class I Airsheds such as the Pecos Wilderness (Forest Plan, page 80).
- Minimize the amount of soil inadvertently mixed in slash piles to reduce smoldering.
- Notify local agencies and the public through radio, TV, newspapers, and/or personal contacts at least a week in advance of the broadcast burns and again the day before the burn.
- If smoke starts to settle and limit visibility along Forest Road 263, Forest Road 156, or other major travel ways, immediately alert motorists of the danger, contact the appropriate State or local traffic control agencies, and close roads if necessary.

Social Environment and Public Safety

- Notify property owners and residents about scheduled haul periods, using the media, mailings, or other means of notification.
- Post warning signs about truck traffic where appropriate.
- Close trails and work areas during project implementation.

Heritage Resources

- Survey for and mark heritage resource sites within project units according to specifications provided in FSM 2309.24 and FSH 2361.28. Project implementation will comply with the Programmatic Agreement among the USDA Forest Service, Southwestern Region, the New Mexico State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding the Gallinas Watershed Project ("the Gallinas Watershed Programmatic Agreement") and the First Amended Programmatic Agreement regarding Historic Property Protection and Implementation

among the New Mexico State Historic Preservation Officer, Arizona State Historic Preservation Officer, Texas State Historic Preservation Officer, Oklahoma State Historic Preservation Officer, the Advisory Council on Historic Preservation and the USDA Forest Service, Region 3 ("the Amended Region 3 Programmatic Agreement").

- The Forest Archeologist will review all road maintenance activities connected to the project and outside of project units to determine whether such activities have the potential to affect heritage resource properties, as described in Appendix A, Section III of the Amended Region 3 Programmatic Agreement. If there is a potential to affect heritage resource properties, survey for and mark heritage resource sites along roads to be maintained according to specifications provided in FSM 2309.24 and FSH 2361.28.
- Avoid damage and loss to heritage resources, including sites, structures and traditional cultural properties, through avoidance or other mitigation measures. If it is not possible to avoid or protect heritage resources or if mitigation measures prove unsuccessful, then data recovery (archeological excavations and/or investigations) may be conducted.
- Do not restrict access to a traditional cultural property located within the Gallinas Watershed. Leave open access to the Hermit Peak and El Porvenir Trails (Trails 223 and 247) during all project activities.
- Allow broadcast burning within heritage resource sites not defined as fire-sensitive in Appendix D of the Gallinas Watershed Programmatic Agreement, when approved by the Forest Archeologist.
- Avoid broadcast burning all heritage resource sites defined as fire-sensitive in Appendix D of the Gallinas Watershed Programmatic Agreement. Protect these sites from damage or destruction during burning through one or more of the methods listed in Appendix C of the Gallinas Watershed Programmatic Agreement.
- Allow thinning within heritage resource sites when approved by the Forest Archeologist. Conduct thinning within heritage resource sites in accordance with the provisions listed in Appendix C of the Gallinas Watershed Programmatic Agreement.
- If previously undocumented heritage resource sites are discovered during project activities, or if sites are damaged during project activities, stop all work in the immediate vicinity of the sites and will not restart until authorized by the Forest Archeologist.

Comparison of Alternatives

The only items listed below are those for which the outputs or effects differed between alternatives.

Table 4. Outputs by alternative

	Alternative 1 No Action	No Action with wildfire	Alternative 2 Proposed Action	Alternative 3 More thinning	Alternative 4 Less thinning, less prescribed burning
Thinning (acres)	0	0	5,104	6,801	3,420
Prescribed burning - pile burn or broadcast burn (acres)	0	0	8,001	8,859	3,420
Shaded fuelbreaks (acres)	0	0	625	1,591	1,725
Wood (cords)	0	0	27,028	62,128	20,648
Road improvements (miles)	0	unknown	11	11	11

Table 5. Effects by alternative

		Alternative 1 No Action (baseline)	No Action with wildfire	Alternative 2 Proposed Action	Alternative 3 More thinning	Alternative 4 Less thinning, less prescribed burning
Soil and Water	Total soil loss (tons)	7,564	574,939	20,812	22,434	11,478
	Average soil loss (tons/year)	1,513	Highest first year, then decreases	4,162	4,487	2,296
	Total sedimentation (tons)	207	69,870	3,806	4,379	2,448
	Average sedimentation (tons/year)	207	Highest first year, then decreases	761	876	490
	Water quality	Meets state standards	Does not meet state standards	Meets state standards	Meets state standards	Meets state standards
	Peak flows	No change	Increase up to 200x	No change	No change	No change

		Alternative 1 No Action (baseline)	No Action with wildfire	Alternative 2 Proposed Action	Alternative 3 More thinning	Alternative 4 Less thinning, less prescribed burning
	Site productivity	No change	Loss	No change	No change	No change
Air	PM-10 (tons)	0	11,880	622	677	288
	PM-2.5 (tons)	0	10,692	565	564	261
	Total days of burning	0	10 to 25	69	79	38
	Average days of burning (days/year)	0	10 to 25	7 to 14	8 to 16	8
Forest Vegetation, Fuels, and Wildfire Behavior (in treated stands)	Wildfire behavior	n/a	Active crown fire	Surface fire	Surface fire	Surface / Passive crown fire
	Flame length (feet)	n/a	2 to 17 (90th) 71 to 107 (97.5)	1 to 4 (90th) 1 to 8 (97.5)	2 to 17 (90th) 71 to 107 (97.5)	2 to 17 (90th) 71 to 107 (97.5)
	Torching index (miles per hour)	n/a	0 to 10	30 to 120	30 to 120	30 to 120
	Crowning index (miles per hour)	n/a	12 to 15	20 to 45	20 to 45	20 to 45
	Canopy bulk density (lb/cu yd)	0.25 to 0.30	No canopy following wildfire	0.003 to 0.004	0.003 to 0.004	0.003 to 0.004
	Canopy cover	Average 67% closure	0 to 10%	Average 40% closure	Average 40% closure	Average 40% closure
	Vegetative structural stage	Young	Meadow / seedling	Mid-aged/mature	Mid-aged/mature	Mid-aged
	Basal area (sq. feet/acre) (treated stands)	120 to 200	100 to 150 (dead)	1 to 70 (depends on stand)	1 to 70 (depends on stand)	1 to 70 (depends on stand)

		Alternative 1 No Action (baseline)	No Action with wildfire	Alternative 2 Proposed Action	Alternative 3 More thinning	Alternative 4 Less thinning, less prescribed burning
	Stand density index (treated stands)	40 to 60%	n/a	20 to 25%	20 to 25%	20 to 25%
	Crown-to-base height (feet)	0 to 5	n/a (no crowns)	> 10	> 10	> 10
	Average no. of trees per acre > 0 inch in diameter in ponderosa pine and mixed conifer (weighted average of treated and untreated stands)	1,300 to 1,600	Standing dead	500 – 900	500 – 800	900 – 1,300
	Broadcast burn without thinning (acres)	0	n/a	3,280	1,209	0
	Protection at landscape level	very low	n/a	high	high	low to medium
Scenery	Meets visual quality objectives?	yes	yes	yes	yes	yes
	Visual effect > 1 year after treatment	n/a	black trees, bare soil	slash piles, black ground	slash piles, black ground, helicopter landings	slash piles, black ground
	Visual effect < 1 year after treatment	n/a	black trees, grass, aspen	more open, more views	more open, more views	more open, more views

		Alternative 1 No Action (baseline)	No Action with wildfire	Alternative 2 Proposed Action	Alternative 3 More thinning	Alternative 4 Less thinning, less prescribed burning
Recreation	Facilities lost	0	2 campgrounds 5 day-use areas	0	0	0
	Days areas closed	0	Closed during fire (~10 - 20 days), possibly permanent losses	1 day to 3 months, depending on the area	1 day to 3 months, depending on the area	1 day to 3 months, depending on the area
	Recreation visitor days lost	0	up to 44,500	up to 9,900	up to 9,900	up to 6,000
Heritage Resources	Potential damage from treatments	none	n/a	very low	very low	very low
	Potential damage from wildfire	n/a	very high	low	low	medium
Social	Noise	none	high for up to 1 month	medium for up to 1 month	medium for up to 1 month	low
	Safety during action	n/a	low	high	high	very high
Wildlife and Fish	Population viability	n/a	decreases for MSO & fish	no change	no change	no change
	Habitat quality	n/a	reduction for most species	improve	improve	improve

Chapter 3 – Environmental Consequences

Introduction

This chapter describes the potential environmental consequences of the alternatives. The discussion of resources and potential effects takes advantage of existing information from the Santa Fe National Forest Plan's Final Environmental Impact Statement, project-specific resource reports, and other sources. Where used, such information is summarized and referenced to minimize duplication. The planning record for the Gallinas Municipal Watershed WUI project contains the full text of all project-specific information. The project record is located at the Pecos Ranger Station in Pecos, New Mexico. It is available for review during regular business hours.

Key Issues: Environmental Consequences

Water Quality

The issue related to water quality is:

> *Using ground-based harvesting equipment, creating skid trails, and blading road surfaces compacts and exposes soil. Compacted and/or exposed soil is more likely to erode; some soil could erode into nearby streams (sedimentation). Sedimentation degrades water quality.*

The discussion of effects to soil and water, including the calculations of erosion and sedimentation, is summarized from the forest hydrologist's report. All figures have been rounded to the nearest hundred.

Soil and Water – Affected Environment

Erosion

Erosion is the result of soil detaching from its immediate site and moving. The TES (Terrestrial Ecosystems Survey) provides erosion rates for each soil type in the watershed (USDA Forest Service 1993). Taking the rates listed for each soil type, we used the Universal Soil Loss Equation (USLE) to calculate background erosion rates from the proposed treatment areas (Wischmeier 1978). The background rate of erosion from the proposed action treatment area was calculated to be about 7,600 tons per year.

The soils map (Figure 23) shows soils to be avoided with ground-based heavy equipment because of its inherent erosivity and/or proximity to streams.

About 80 percent of the slopes in the watershed are steeper than 40 percent.

Sedimentation

Sedimentation is detached soil that reaches a stream channel. Sediment delivery is the rate at which soil reaches a stream channel. The current rate of sediment delivery from the proposed action footprint is about 200 tons per year (0.02 tons per acre), three percent of the eroded soil.

Water Quality

The New Mexico Environment Department's Surface Water Quality Bureau (SWQB) monitors stream conditions in accordance with the Federal Clean Water Act and publishes a 303(d) list that summarizes the condition of assessed streams. The SWQB considers Gallinas Creek from the diversion for the Las Vegas reservoirs to the headwaters to be one reach, and it contains both private and National Forest System lands. The SWQB lists this section of Gallinas Creek as not fully supporting the use of "high quality cold water fishery" due to turbidity, metals, temperature, and stream bottom deposits (NMED SWQB 2002). The 303(d) list cites the probable sources of pollution as agriculture, road maintenance/runoff, removal of riparian vegetation, and modification/destabilization of stream banks.

When evaluating stream health, the SWQB collects samples both on and off National Forest System lands to characterize the whole reach. As a result, the condition of Gallinas Creek within the forest boundary is not accurately reflected by the 303(d) list (Hopkins, pers. comm. 2003). In 2001, the Forest Service extensively surveyed that portion of the reach of National Forest System

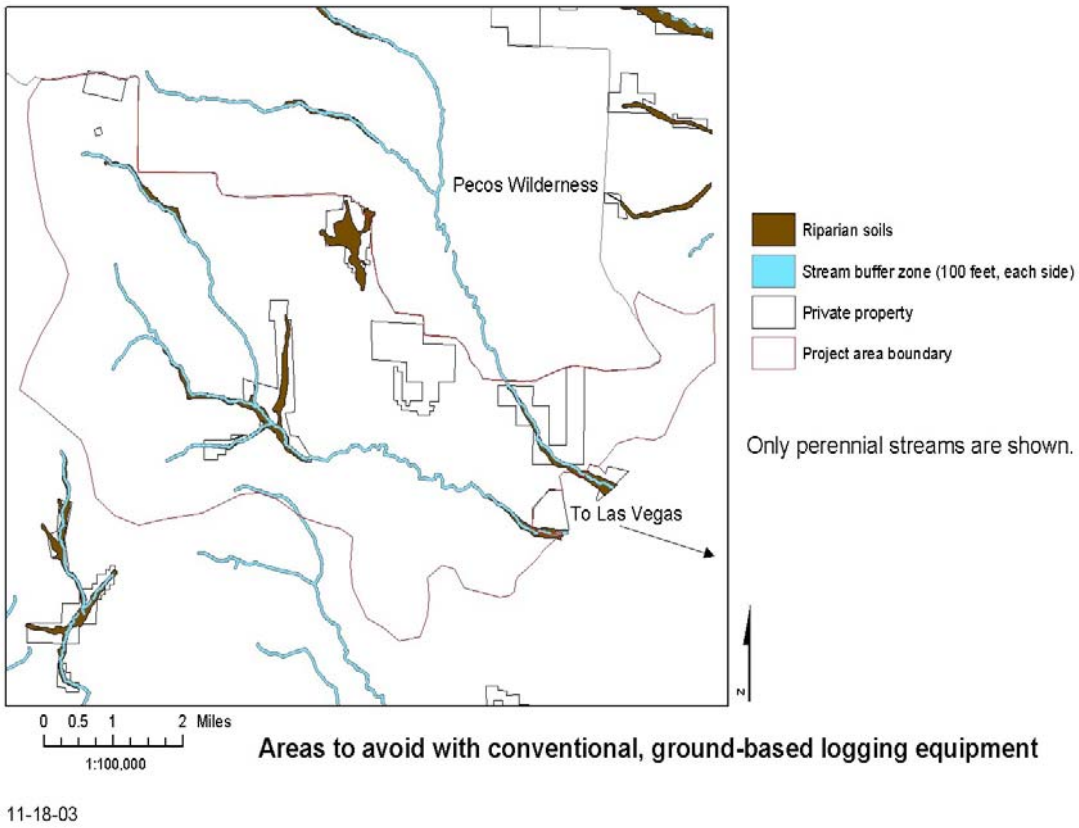


Figure 23. Soils to avoid with conventional, ground-based heavy equipment.

lands, from EV Long Campground to the headwaters, over 10 river miles (Santa Fe National Forest 2003). This survey showed that Gallinas Creek is in "properly functioning condition" for temperature, sediment, and stream bank condition. For example, only 3.2 percent of the stream banks were found to be unstable. In addition, riparian assessments done in 2001 on Gallinas Creek, Burro Creek, Calf Creek, Wolf Creek, and Youngs Creek showed all these streams to be in properly functioning condition (PFC surveys). The SWQB assessed the reach in the summer of 2001, and it agreed that the condition of the creek on National Forest System lands is good to excellent (Hopkins, pers. comm. 2003). The listing of the reach as "impaired" was a carryover from 2001; SWQB did not have time to review the listing before the document had to be published (Hopkins, pers. comm. 2003).

The threshold for evaluating the alternatives will be whether they meet the State of New Mexico's water quality standards, which read:

"Surface waters of the state shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom." (WQCC 2002, 20.6.4.12(A)).

Peak Flows

A peak flow is the highest, instantaneous, recorded volume of water passing a reference gage in a channel, often used as an indicator of flow from storms. Peak flow is measured in cubic feet per second (cfs). It is dependent on the intensity of rainfall, soil type, and the amount of soil without vegetation. Gallinas Creek's lowest peak flow on record is 0.2 cfs, which occurred in October 1922, September-October 1956, and December 1964. The highest peak flow was 7,120 cfs, which occurred in August 1966. In 1995, the highest peak flow was 366 cfs, and in 2000 it was 77 cfs (USGS 1995 and 2000).

Site Productivity

Site productivity predicts how well vegetation will grow on a given soil. As defined in the TES, "tolerance" is the rate of soil loss that can occur while sustaining inherent site productivity (USDA Forest Service 1993). In its existing condition, the treatment areas do not exceed the tolerance for soil loss. Existing soil loss is about 7,600 tons per year, whereas the tolerance is calculated at about 26,300 tons per year.

Soil and Water - Environmental Consequences

Direct/Indirect Effects of Alternative 1 – No Action

There would be no change from the existing condition just described above in Affected Environment.

No Action with Wildfire

For this scenario, we assumed that an 11,000-acre wildfire would occur in the project area. Based on burn severity maps from the Viveash Fire, we assumed that 50 percent of the area would be a severe burn, 20 percent a moderate burn, and 30 percent low or unburned (Viveash burn severity map).

Erosion

Field analysis of the Viveash Fire showed that it caused the soil to be hydrophobic over wide areas (USDA Forest Service 2000). Hydrophobicity is a temporary “sealing” of the soil layer, reducing infiltration and increasing erosion. Based on the Viveash Fire, we assumed that 50 percent of the burned area would become hydrophobic for 1 to 2 years following a fire.

We based our soil loss calculations on characteristics of the watershed’s existing soils (USDA Forest Service 1993) and modeled how they would likely to respond to wildfire by assigning an appropriate hydrophobicity factor.

Our calculations show that approximately 575,000 tons of soil would mobilize following a fire (approximately 52 tons per acre). Ash from the fire would also move, but we did not account for this in our model. Based on post-fire field observations after the Cerro Grande Fire, ash flow was observed to increase temporarily the volume of runoff by 25 percent (Kuyumjian, pers. comm. 2003).

Sedimentation and Water Quality: We assumed sediment delivery to be a portion of the base erosion rate. We used the sediment delivery factors developed by the BAER team (Burned Area Emergency Rehabilitation) for the Viveash Fire. The factors take into account vegetation, burn severity, and soil type. Our calculations show that about 69,900 tons potentially would reach Gallinas Creek, about 6 tons per acre. This is about 12 percent of the total amount of eroded soil. Based on observations of Cow Creek after the Viveash Fire, sedimentation generally is greatest the first year after a fire, decreasing exponentially each year. Generally, sedimentation returns to background rates within 4 to 5 years.

The sedimentation caused by a wildfire following summer monsoons would likely kill most or all fish, alter the stream channel, and coat the bottom of the stream with fine sediments as was seen in Cow Creek after the Viveash Fire.

For example, about 1,500 acres of the Upper Gallinas Watershed was burned during the Viveash Fire. Sedimentation following the wildfire temporarily threatened Las Vegas’ water supply, which is derived from the Gallinas River. After rainstorms that summer, the city had to divert water that contained too much sediment for the treatment works to process. A wildfire occurring entirely in the watershed would likely produce even more sediment, possibly preventing the city from being able to supply any water (Tafoya, pers. comm. 2003).

Figure 24. Flooding in Cow Creek (July 2000) after the Viveash Wildfire.

Peak Flow: After the Viveash Fire, Cow Creek flooded regularly. For example, on July 11, 2000, the Santa Fe National Forest estimated the flow in Cow Creek to be 2,000 cfs. Photos of Cow Creek on July 11, 2000 show the flood rapidly overtopping its 8- to 10-foot bank and filling the entire 200-foot wide valley (see Figure 24).

Flooding and runoff similar to that of Cow Creek (as shown in Figure 24) is predicted for the Gallinas River in the aftermath of a high severity wildfire. The magnitude, duration and intensity of such flood events are a function of the geomorphology (steepness of slope, length of slope and flood plain area) of the upper Gallinas watershed.

Site Productivity

The tolerance for soil loss over our assumed 11,000-acre burn is calculated at about 34,200 tons per year. Predicted at about 575,000 tons, soil loss from a high-severity wildfire would greatly exceed the tolerance and result in a loss of site productivity.

Direct/Indirect Effects of Alternative 2 – Proposed Action

Erosion

Implementing the Proposed Action would mobilize approximately 21,000 tons of soil (approximately 2.5 tons per acre over the 8,400 acres proposed for treatment). The project is expected to last from 5 to 10 years with only a portion of treatments happening each year; therefore, the amount of erosion would be spread fairly equally over the life of the project. Further, the erosion from project activities would be spread out during each year, unlike a wildfire that would concentrate erosion in a few months.

About 11 miles of forest system roads would be maintained or improved (see Figure 12). Though blading the road surface exposes mineral soil and leaves it susceptible to erosion, none of the roads to be maintained cross a perennial stream (see Figure 25). The roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams; very little sedimentation would occur from the proposed road maintenance. Most of Forest Road 263, along Gallinas Canyon, was paved to prevent erosion and sedimentation. Further, all stream crossings on this road are via bridges. Thus, road maintenance for this project would not increase sediment delivery to the waters of the project area.

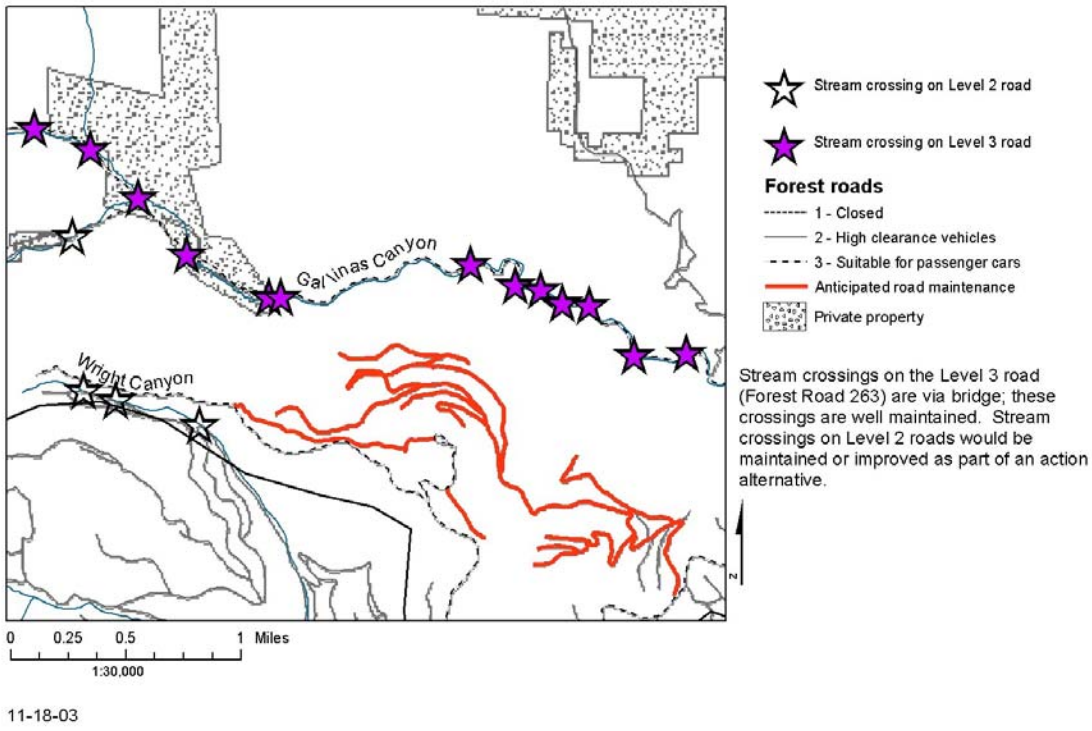


Figure 25. Stream crossings in the project area.

Ground-based logging and skidding equipment used to move thinned trees creates skid trails, which also exposes soil and causes compaction. Pursuant to the Forest Plan, skidding is restricted to slopes of less than 40 percent to reduce erosion (Forest Plan, p. 75). Around Johnson Mesa, existing skid trails and landings that are not located near live water would be used; therefore, thinning here would not increase the overall acreage of compacted soils and subsequent sedimentation. Pushing slash into piles with a tractor would turn up some soil, though an experienced operator can limit the amount of soil by keeping the blade above the surface. Piling slash with a loader that picks the slash up off the ground would not expose a measurable amount of soil. Hand piling slash is not expected to expose measurable amounts of mineral soil.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather, the terrain dictates accessibility. From observations

of other areas like the Gallinas 319 grant areas (see Figure 26), vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, very little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Perhaps five percent of the overall product collection areas (about 100 acres) would be subject to compaction from vehicles. Second, the slopes are very gentle, so exposed soil would not travel far and be intercepted by the existing forest vegetation.

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the district (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion. A broadcast burn conducted in unthinned stands is also not likely to expose much bare mineral soil; however, we conservatively predicted that a small percentage (5 percent or about 165 acres) of soils underlying high burn-intensity areas would be available for transport, along with ash. In the years following burning, grass would grow on the sites, stabilizing soils and lessening erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it would be “caught” and held by the vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Sedimentation and Water Quality: A certain portion of eroded soil would be delivered to streams in the form of sediment. We assigned a sediment delivery factor to each soil based on the Viveash Soil Loss Conventions developed by the Burned Area Emergency Rehabilitation team. Over the life of the project, total sedimentation would be about 4,200 tons, about one-half ton per acre. Assuming the project lasts from 5 to 10 years, the average sediment delivery per year would be about 420 to 840 tons, 2 to 4 times the annual background rate.

The Proposed Action is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in stream bank conditions or channel flow (refer to the State of New Mexico’s Water Quality Standard cited earlier). The amount of sediment delivered would be too small to cause any noticeable change in stream function.

Peak Flow: A measurable change in peak flows from project activities is not expected. About 500 to 1,000 acres, about three percent of the watershed, would be treated each year. Thus, most of the watershed would remain in its current condition and would have peak flows close to the existing condition.

Site Productivity: The Proposed Action would not cause soil erosion or compaction that exceeds the tolerance level, so site productivity will not change (see Table 6).

Direct/Indirect Effects of Alternative 3 – More Thinning

Erosion: We estimate that Alternative 3 would mobilize approximately 22,400 tons of soil (approximately 2.5 tons per acre over the 8,800 acres proposed for treatment). The project is expected to last 5 to 10 years with only a portion of treatments happening each year; therefore, the amount of erosion would be spread fairly equally over the life of the project. Further, the

erosion from project activities would be spread out during each year, unlike a wildfire that would concentrate erosion in a few months.

About 11 miles of forest system roads would be maintained or improved (see Figure 12). Though blading the road surface exposes mineral soil and leaves it susceptible to erosion, none of the roads to be maintained cross a perennial stream (see Figure 25). The roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams; very little sedimentation would occur from the proposed road maintenance. Most of Forest Road 263 along Gallinas Canyon was paved to prevent erosion and sedimentation. Further, all stream crossings on this road are via bridges. Thus, road maintenance for this project would not increase sediment delivery to the waters of the project area.

Ground-based logging and skidding equipment used to move thinned trees creates skid trails, which also exposes soil and causes compaction. Pursuant to the Forest Plan, skidding is restricted to slopes of less than 40 percent to reduce erosion (Forest Plan, p. 75). Around Johnson Mesa, existing skid trails and landings that are not located near live water would be used; therefore, thinning here would not increase the overall acreage of compacted soils and subsequent sedimentation (Figure 25). Pushing slash into piles with a tractor would turn up some soil, though an experienced operator can limit the amount of soil by keeping the blade above the surface. Piling slash with a loader that picks the slash up off the ground would not expose a measurable amount of soil. Hand piling slash is not expected to expose measurable amounts of mineral soil.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather, the terrain dictates accessibility. From observations of other areas like the Gallinas 319 grant areas (see Figure 26), vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, very little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Perhaps five percent of the overall product collection areas (about 100 acres) would be subject to compaction from vehicles. Second, the slopes are very gentle, so exposed soil would not travel far and be intercepted by existing forest vegetation.

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the district (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion. A broadcast burn conducted in unthinned stands is also not likely to expose much bare mineral soil; however, we conservatively predicted that a small percentage (five percent or about 60 acres) of soils underlying high burn-intensity areas would be available for transport, along with ash. In the years following burning, grass would grow on the sites, stabilizing soils and lessening erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it would be "caught" and held by the vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Helicopter yarding is not expected to cause erosion because the helicopters do not touch the ground; hand crews thin the trees and then load them onto a cable suspended from the helicopter and no trees are dragged along the ground.

Sedimentation and Water Quality

A certain portion of eroded soil would be delivered to streams in the form of sediment. We assigned a sediment delivery factor to each soil based on the Viveash Soil Loss Conventions developed by the Burned Area Emergency Rehabilitation team. Over the life of the project, sedimentation would total about 4,500 tons, about one-half ton per acre. Assuming the project lasts 5 to 10 years, the average sediment delivery per year would be about 450 to 900 tons, 2 to 4 times the annual background rate.

Alternative 3 is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in stream bank conditions or channel flow (refer to the State of New Mexico's Water Quality Standard cited earlier). The amount of sediment delivered would be too small to cause any noticeable change in stream function.

Peak Flow

A measurable change in peak flows from project activities is not expected. About 500 to 1,000 acres, about three percent of the watershed, would be treated each year. Thus, most of the watershed would remain in its current condition and would have peak flows close to the existing condition.

Site Productivity

Alternative 3 would not cause soil erosion or compaction that exceeds the tolerance level, so site productivity will not change (see Table 6).

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning

Erosion

We estimate that Alternative 4 would mobilize approximately 11,500 tons of soil (approximately 3.4 tons per acre over the 3,400 acres proposed for treatment). The project is expected to last about five years with only a portion of treatments happening each year; therefore, the amount of erosion would be spread fairly equally over the life of the project. Further, the erosion from project activities would be spread out during each year, unlike a wildfire that would concentrate erosion in a few months.

About 11 miles of forest system roads would be maintained or improved (see Figure 12). Though blading the road surface exposes mineral soil and leaves it susceptible to erosion, none of the roads to be maintained cross a perennial stream (see Figure 25). The roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams; very little sedimentation would occur from the proposed road maintenance. Most of Forest Road 263 along Gallinas Canyon was paved to prevent erosion and sedimentation. Further, all stream crossings on this road are via bridges. Thus, road maintenance for this project would not increase sediment delivery to the waters of the project area.

Ground-based logging and skidding equipment used to move thinned trees creates skid trails, which also exposes soil and causes compaction. Pursuant to the Forest Plan, skidding is restricted to slopes of less than 40 percent to reduce erosion (Forest Plan, p. 75). Around Johnson Mesa, existing skid trails and landings that are not located near live water would be used; therefore, thinning here would not increase the overall acreage of compacted soils and subsequent sedimentation. Pushing slash into piles with a tractor would turn up some soil, though an experienced operator can limit the amount of soil by keeping the blade above the surface. Piling slash with a loader that picks the slash up off the ground would not expose a measurable amount of soil. Hand piling slash is not expected to expose measurable amounts of mineral soil.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather, the terrain dictates accessibility. From observations of other areas like the Gallinas 319 grant areas (see Figure 26), vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, very little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Perhaps five percent of the overall product collection areas (about 100 acres) would be subject to compaction from vehicles. Second, the slopes are very gentle, so exposed soil would not travel far and be intercepted by the existing forest vegetation.

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the district (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it would be “caught” and held by the vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Sedimentation and Water Quality

A certain portion of eroded soil would be delivered to streams in the form of sediment. We assigned a sediment delivery factor to each soil based on the Viveash Soil Loss Conventions developed by the Burned Area Emergency Rehabilitation team. Over the life of the project, sedimentation would total about 2,300 tons, about six-tenths of a ton per acre. Assuming the project lasts five years, the average sediment delivery per year would be about 230 tons, twice the annual background rate.

Alternative 4 is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in stream bank conditions or channel flow (refer to the State of New Mexico’s Water Quality Standard cited earlier). The amount of sediment delivered would be too small to cause any noticeable change in stream function.

Peak Flow

A measurable change in peak flows from project activities is not expected. About 500 to 1,000 acres, about three percent of the watershed, would be treated each year. Thus, most of the watershed would remain in its current condition and would have peak flows close to the existing condition.

Site Productivity

Alternative 4 would not cause soil erosion or compaction that exceeds the tolerance level, so site productivity will not change (see Table 6).

Table 6. Erosion and sedimentation by alternative. Numbers have been rounded to the nearest hundred.

	Alternative 1 No Action (Background Rate)	No Action with Wildfire*	Alternative 2 Proposed Action	Alternative 3 More Thinning	Alternative 4 Less Thinning, Less RX Burn
Total Soil Loss (tons)	7,600	575,000	20,800	22,400	11,500
Average Soil Loss – 5 year project (tons/yr)	1,500	---	4,200	4,500	2,300
Soil Loss Tolerance (tons/yr)	26,300	34,200	26,300	29,300	13,300
Total Sedimentation (tons)	200	69,900	3,800	4,400	2,400
Average sediment delivery (tons/yr)	200	---	800	900	490

** No averages provided because not an annual event. Most damage would be done in the first 2 to 3 years following a fire.*

Cumulative Effects to Soil and Water

The geographic bounds for the cumulative effects analysis for erosion and site productivity are the project area because these affect the most immediate area only. The geographic bounds for the cumulative effects analysis for sedimentation and water quality is from the headwaters of Gallinas Creek to the diversion works for the city of Las Vegas because this area drains the water that supplies the city. The geographic bounds for the cumulative effects analysis for peak flow is

the south end of the city of Las Vegas because it is the nearest, largest populated area that could be affected by flooding.

Figure 26 depicts these boundaries as well as past, present, and reasonably foreseeable future actions that could have contributed to cumulative effects to soil and water.

Table 7. Possible sources of cumulative effects to soil and water.

Action	Entity	Date	Short-term Effect (1 year or less)	Long-term Effect (1 year or more)
Timber sale during construction of Forest Road 156	USDA Forest Service	late 1960's	Erosion, sedimentation from road construction	None at present
Pave part of Forest Road 263	USDA Forest Service	1994	Sedimentation	Decrease erosion and sedimentation
319 grant watershed improvement projects	USDA Forest Service	1999 - 2003	Decrease erosion and sedimentation	Decrease erosion and sedimentation
Create 1.5 acres wetlands in Canovas Canyon	USDA Forest Service	1999	Sedimentation	Decrease sedimentation
Viveash Fire		2000	Erosion, sedimentation	Sedimentation
Lone Pine Fire		2000	Sedimentation	None
Thinning and burning in Maestas/Las Dispensas	USDA Forest Service	2001 - 2003	Sedimentation	Decrease sedimentation, risk of fire
Bridge replacement in Gallinas	State of New Mexico	2002	Sedimentation	Decrease sedimentation
Thinning and burning on Forest Road 18 (contract and in-house)	USDA Forest Service	1993 - 2005	Sedimentation	Decrease sedimentation, risk of fire
Thin around Bradner and Peterson reservoirs	City of Las Vegas	2003 - ?	Erosion, sedimentation	Decrease sedimentation, risk of fire
Subdivision construction near Gallinas	Private landowner	2004?	Sedimentation	Sedimentation, increase surface runoff
Grazing in wilderness	Permittee's cattle	on-going	Possible erosion	Possible erosion, sedimentation
Thin and burn	Private landowners	???	Sedimentation	Decrease sedimentation, risk of fire

Because none of the action alternatives would cause enough erosion to change site productivity, there would be no cumulative change in site productivity. Likewise, none of the action alternatives would change peak flows, so there would be no cumulative change in peak flows caused by this project.

The action alternatives would increase slightly the amount of sedimentation reaching Gallinas Creek. It is not feasible to quantify the amount of sedimentation occurring from each of the actions listed above. Any action occurring in or before 2001 did not affect water quality, since the 2001 survey by the SWQB showed Gallinas Creek to be in good condition. Of the actions occurring after 2001 and into the future, all except the subdivision and grazing are designed to reduce the amount of sedimentation. Thus, this project would cumulatively increase sedimentation only with concurrent actions, possibly the construction of the subdivision and thinning and burning by private landowners. Because the effects of this project would be spread out over the course of the year, it is not expected to contribute to a cumulatively measurable change in sedimentation or water quality.

The cumulative beneficial effect of any of the action alternatives would be to reduce the risk, at a landscape level, of having a large, high-intensity wildfire. Avoiding such a fire would also avoid the soil damage, erosion, and sedimentation that normally follow.

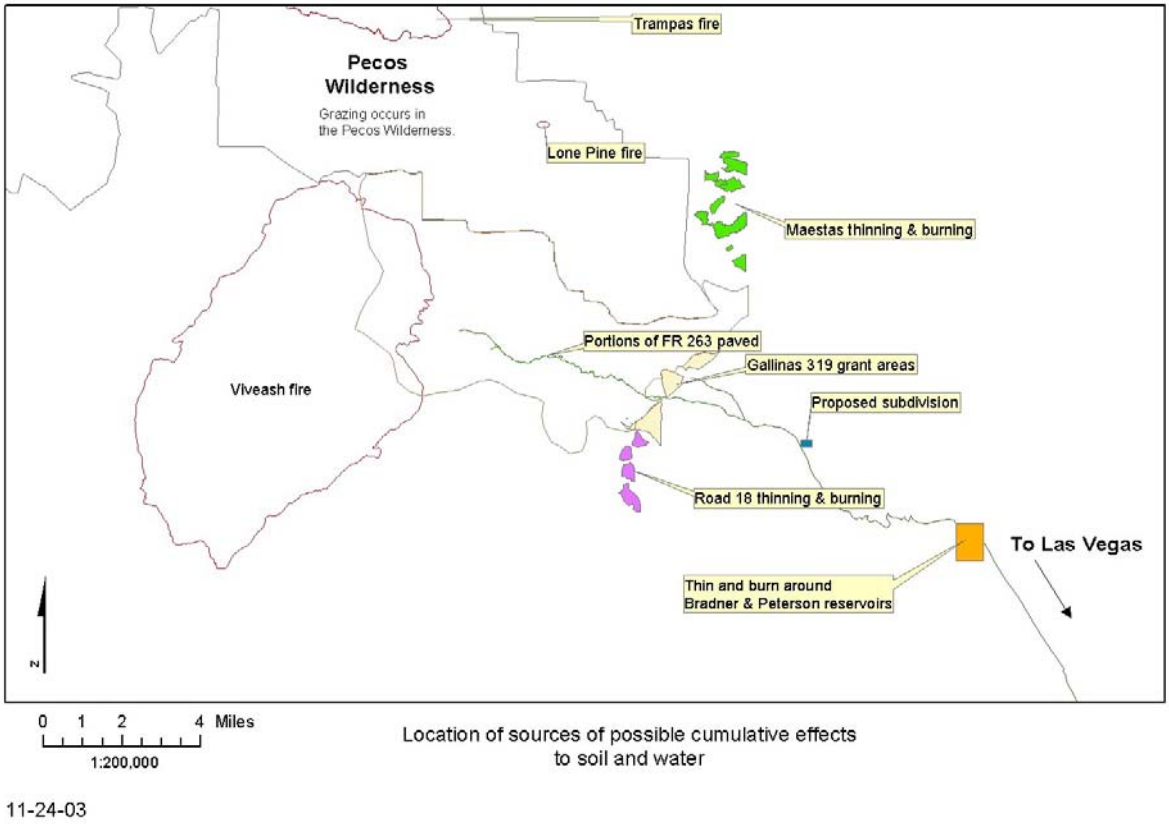


Figure 26. Possible sources of cumulative effects to soil and water

Air Quality/Smoke

The issue associated with air quality is:

> *Prescribed burning, especially broadcast burning, produces smoke. Under certain atmospheric conditions, the smoke could settle in areas where people live, work, or recreate. The smoke could cause respiratory problems for some people, and it could also create a safety hazard by limiting visibility.*

Air – Affected Environment

The geographic bounds for this analysis differed between nighttime and daytime (see Figure 27). At night, the boundary is the village of Gallinas because smoke would settle into and travel down the canyon, dispersing as far the village. During the day, the outer boundary is the village of Sapello because smoke will rise and be dispersed toward the northeast by the prevailing southwesterly winds. (This phenomenon was observed during the Viveash and Cerro Grande Fires.) The area northeast of Sapello is also very sparsely populated.

The infrastructure within the potentially affected area that may be sensitive to smoke, such as views, hospitals, airports, schools, highways, and/or businesses are:

- The city of Las Vegas and communities within 16 miles of the project area, including Gallinas, San Ignacio, Sapello, Rociada, South Carmen, some schools in San Miguel County, medical centers, and the Las Vegas Airport.
- Forest Roads 263 (Gallinas Canyon), Forest Road 156 (Johnson Mesa), EV Long and El Porvenir Campgrounds, Pecos and Wheeler Peak Wilderness areas, and scenic views and picnic areas therein (effects to these are discussed in the Scenic Resources section).
- Private property including Evergreen Valley, Terrell Ranch, Harvey Ranch, El Cielo, El Porvenir Christian Camp, and Calf Canyon.
- Interstate 25, State Highway 65, State Highway 518 to Mora, and local roads.

The Clean Air Act (CAA) created two categories of airshed, Class I and Class II. The Pecos Wilderness to the north of the project area is a designated Class I airshed. Everything else lies within the Upper Rio Grande Basin airshed and is considered to be Class II. The watershed and surrounding area typically have excellent air quality; the entire area meets CAA attainment status. In the analysis area, a minor amount of road dust is produced by vehicles driving on unsurfaced roads. A minor amount of smoke is generated seasonally by campfires, wood stoves, and burning trash.

The State of New Mexico follows Federal guidelines for emissions of hazardous air pollutants,

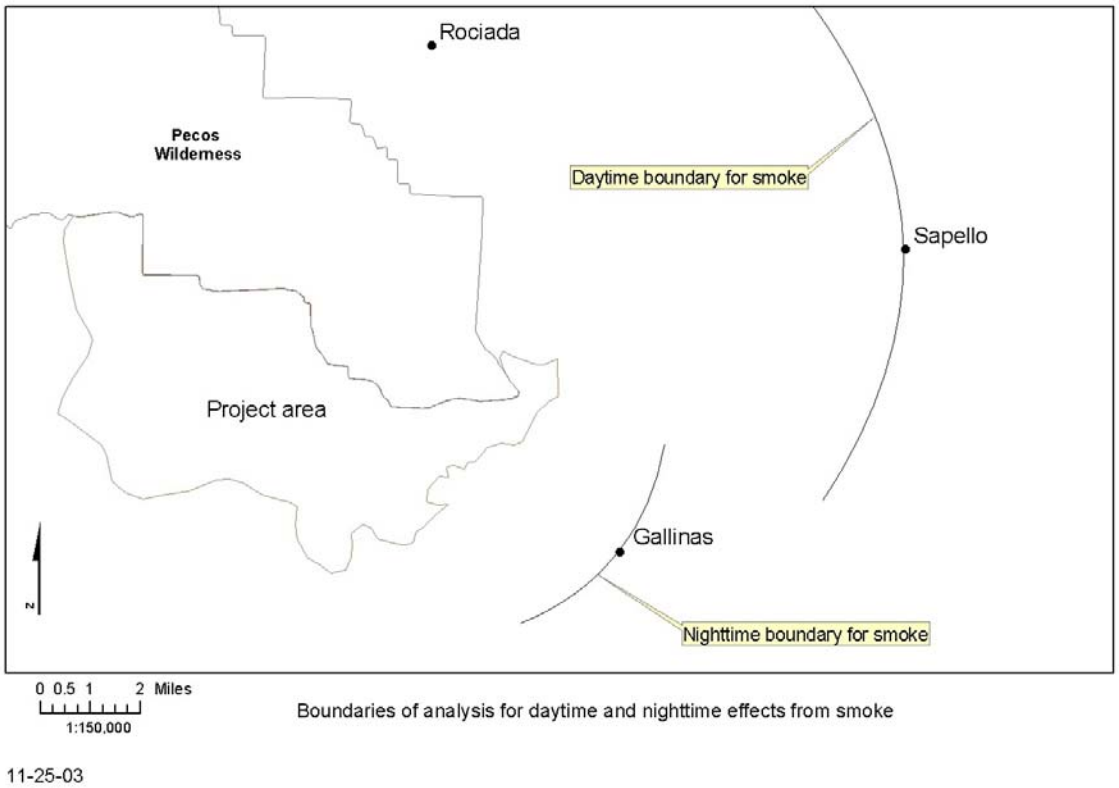


Figure 27. Boundaries of effects analysis for smoke.

which are:

Particulate Size	Emission Limit
PM-10	150 Ug/m3 over a 24-hour period
PM-2.5	65 Ug/m3 over a 24-hour period

PM-10 and PM-2.5 may impair human health and visibility. PM-10 causes eye, nose, and throat irritation, while PM-2.5 can cause more serious health impairments, such as chronic respiratory disease, emphysema, or lung cancer. The degree to which smoke causes negative health effects depends upon the person's general respiratory condition, their sensitivity to emissions, and the type and amount of smoke, gas, or particulate matter. Particulate matter can also impair visibility, leading to traffic accidents or problems with landing planes at airports. Any particulate matter currently generated comes from campfires, wood stoves, and trash burning; however, the amount is very small.

Air – Environmental Consequences

Direct/Indirect Effects of Alternative 1 – No Action/No Wildfire

There would be no change from the existing condition just described.

No Action with Wildfire

To analyze this scenario, we assumed that a large, high severity wildfire occurred in the watershed, burning 11,000 acres before suppression was successful. This is in line with recent fires that have occurred in New Mexico, such as the Cerro Grande (2000), Viveash (2000), and Encedo (2003) Fires.

In a large wildfire, the amount and dispersal of smoke could not be controlled. The amount of smoke generated by such a wildfire would be much greater than that produced from a prescribed burn in which smoke management techniques are employed. The smoke would contain large amounts of pollutants that would likely exceed state air quality standards for particulate emissions. Firefighters working close to the fire could be affected by emissions of carbon monoxide.

A wildfire would probably distribute a great amount of smoke over a large area. For example, in 1996 the Dome Fire impaired air quality and reduced visibility in Santa Fe and on Interstate 25, over 20 miles from the fire. The 2000 Cerro Grande Fire near Los Alamos affected the entire northern Rio Grande Valley, from Española into Colorado, impairing visibility and causing air quality alerts and precautionary evacuations in Española. Based on phone conversations with staff at the Española Hospital, there was a noticeable increase in people coming to the hospital with respiratory problems during the Cerro Grande Fire.

We estimate emissions of PM-10 during an 11,000-acre wildfire would be 11,880 tons; emissions of PM-2.5 would be 10,692 tons. Daily particulate loads from a wildfire would be 4 to 6 times more than those for prescribed burning, and smoke could last for up to 20 days, or as long as it takes to suppress the fire.

Weeks of exposure to smoke with high concentrations of pollutants increases the potential for adverse health effects. People would have eye and upper respiratory irritations. The odor of smoke would be present. People with asthma, bronchitis, or angina would likely leave the area; if

they stayed, they would probably have trouble breathing. All others would be advised to stay indoors with windows and doors closed.

Visibility along roads near the watershed could be less than one-quarter mile. This could result in a high risk of traffic accidents, road closures, or other impacts to motorists along portions of Forest Road 263, State Road 65, and/or State Road 518. There could be major impairments to visibility in portions of the Pecos Wilderness and scenic vistas from Forest Road 156 (Johnson Mesa).

Direct/Indirect Effects of Alternative 2 – Proposed Action

The PM-10 and PM-2.5 emissions from Alternative 2 would be two orders of magnitude smaller than that of the No Action with a wildfire. Emissions of PM-10 from prescribed burning would be 622 tons; emissions of PM-2.5 would be 565 tons. The fire specialist's report contains all calculations. Further, these emissions would be spread out over a period of 5 to 10 years rather than all at once. We estimate 69 days of prescribed burning (pile and broadcast) over the life of the project. This would be 7 to 14 days per year, assuming the project would take at least five years. The Proposed Action would not cause the airshed to reach non-attainment status.

No smoke would be generated from thinning or wood and slash removal; however, there would be other minor impacts to air quality by these activities, such as exhaust from vehicles, heavy equipment, and chain saws. Road dust would be slightly higher than current conditions during these activities unless they are conducted while the ground is frozen or the road is moist. Maintaining roads would also stir up dust; however this kind of dust settles within an hour and is limited in extent (only along the road being maintained).

When burning slash or broadcast burning during the day, most of the smoke would likely dissipate to the north over the southeastern tip of the Pecos Wilderness. During daytime burns, the amount of smoke tends to be greatest for a couple of hours in the late afternoon, when the fire is hottest. Smoke could be noticeable in Sapello, San Ignacio, Mora, and towns northeast of Mora. It may also be slightly noticeable on State Highway 518 to Mora and in the Interstate 25 corridor to Las Vegas. These effects would be short-lived (1 to 5 days, several hours a day) and relatively minor.

In the evenings, residual smoke would probably settle into the Gallinas Canyon bottom and move toward lower elevations. It would flow into the campgrounds at El Porvenir and EV Long, and possibly as far as the village of Gallinas. Wisps of residual smoke might, under certain meteorological conditions, find their way into other drainages like El Porvenir or Ranch Canyon. These effects would be short-lived (1 to 5 days, several hours a day) and relatively minor.

The smell of smoke may last long enough (several days) to become a bit of a nuisance. Because slash piles would likely be burned in the fall or winter when temperatures are cooler, there would be an increased potential for the smoke to linger due to weather inversions. Early morning inversions often lift after about 10 am, after which time smoke would rise and disperse. However, residual smoke could affect the most smoke-sensitive people by causing eye, throat, and nose irritations and coughing, depending on the sensitivity of the individual. The general population would probably not be affected with eye or respiratory irritations.

Visibility to portions of the Pecos Wilderness might be slightly impaired for brief periods (1 to 5 days, several hours a day). Any impacts to visibility from prescribed burns would be much less

than those caused by wildfire. There would be no visibility impacts serious enough to cause problems with airport or highway safety, assuming weather conditions do not change suddenly and unpredictably.

While it is possible for smoke from prescribed burning to travel as far as Mora, this area is not likely to notice much smoke. Based on experience conducting an average of 12,000 acres of prescribed burning per year on the Santa Fe National Forest, surrounding communities are not likely to experience prolonged periods of heavy smoke, and we are not likely to exceed air quality standards or to cause air quality alerts.

Direct/Indirect Effects of Alternative 3 – More Thinning

The PM-10 and PM-2.5 emissions from Alternative 3 would be two orders of magnitude smaller than that of the No Action with a wildfire, but slightly higher than the Proposed Action. Emissions of PM-10 from prescribed burning would be 677 tons; emissions of PM-2.5 would be 564 tons. As above, these emissions would be spread out over a period of 5 to 10 years rather than all at once. We estimate 79 days of prescribed burning (pile and broadcast) over the life of the project. This amounts to 8 to 16 days per year, assuming the project would take at least five years.

The sources of smoke, behavior of smoke, and distance that smoke would travel are the same as described above in Alternative 2.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning

The PM-10 and PM-2.5 emissions from Alternative 4 would be the least of all the action alternatives because it treats the fewest acres. Emissions of PM-10 from prescribed burning would be 288 tons; emissions of PM-2.5 would be 261 tons. As above, these emissions would be spread out over a period of 5 to 10 years rather than all at once. We estimate 38 days of prescribed burning (pile and broadcast) over the life of the project. This amounts to about eight days of burning per year, assuming the project would take five years to complete.

The sources of smoke, behavior of smoke, and distance that smoke would travel are the same as described above in Alternative 2.

Cumulative Effects to Air

The geographic boundary for the cumulative effects analysis is northern New Mexico from Las Vegas to the northern border of Colorado. The past and reasonably foreseeable future actions that could cumulatively contribute to effects are the Maestas prescribed burns, the Road 18 prescribed burns, operation of combustion engines (e.g. vehicles, lawn mowers), fireplaces and wood stoves, dust from unpaved roads, prescribed burning by other land managers, burning on private lands, and wildfires in other areas of the forest. No large industry capable of contributing a lot of PM-10 or carbon monoxide exists.

Broadcast burning for this project would not occur at the same time as either the Maestas or the Road 18 burns, so there would be no cumulative effects to air. Prescribed burning by other land managers and smoke from fireplaces and wood stoves are most likely to overlap with prescribed burning for this project. New Mexico State Forestry plans on awarding several grants to private landowners in the greater Gallinas Watershed to thin and burn, but the exact timing and location of these burns is not yet known. Prescribed burning can be coordinated between land managers so

as not to exceed air quality standards. Fall and winter pile burning could contribute incrementally to the effects from wood stoves and fireplaces. Cumulatively, the effects are not expected to approach concentrations that would exceed air quality standards.

This project may contribute to regional haze, which can result from multiple days of burning and/or multiple owners using the airshed over too short a period of time.

Because San Miguel County is well under non-attainment status for particulates, it is unlikely that the effects from this project would change it. Further, the New Mexico Environment Department's Air Quality Bureau would regulate the release of smoke from all sources on a given day to ensure compliance with Federal air quality standards.

Potential for Escaped Fire

The issue related to fire behavior is:

> *Prescribed burns may escape control measures and threaten the water supply and resources in and around the watershed. Burning unthinned stands may pose the highest risk of fire escape.*

Forest Vegetation, Fuels, and Fire Behavior – Affected Environment

Potential for Escaped Fire

Analysis of weather data for the 20-year period from 1976 to 1996 showed a 37 percent chance of having a day during the fire season that would exhibit average worst fire conditions. "Average worst fire conditions" are dry, windy days when a fire is most likely to start. A fire burning under these conditions would be difficult to control. There is a 20 percent probability of having an ignition occur on a worse fire condition day in any given year. These probabilities are probably conservative given according to climate studies, 1976 to 1996 were the wettest 20 years since 136 B.C. (Mayor-Grissino 1995).

The potential for escape is difficult to measure, since escapes are accidental. Burning unthinned areas would pose the greatest risk for escape; therefore, the evaluation criteria for risk of escape is the number of acres to be broadcast burned without prior thinning.

Wildfire Behavior

Wildfire behavior is governed primarily by weather, topography, and fuels. Changing the latter is the objective of this project. When weather is held constant, changing the structure and composition of live and dead fuels will change fire behavior. We used the computer model called FVS/FFE (Forest Vegetation Simulator, Fire and Fuels Extension) to predict fire behavior. A complete report describing our methodology and assumptions is in the project record. FVS/FFE models fire behavior in individual stands; therefore, we selected a representative stand from each of the main stand types (ponderosa pine, Douglas-fir, and white fir). Our assumption is that all treated stands will behave similarly to these representatives. We assumed a wildfire would occur in the year 2004. FVS/FFE describes three different kinds of wildfire behavior:

- Surface – fire is carried primarily by surface fuels and remains on the ground

- Passive – fire that can torch individual or small groups of trees, but is driven by a surface fire
- Active – fire that produces a solid flaming front in the crowns of trees but is coupled to a surface fire

The evaluation criteria for wildfire behavior will be these descriptors.

Fuel Models

Fuel conditions, defined by quantity and arrangement, have been categorized into 13 standard descriptive fuel models (Andersen 1982). Fuel models are one of the inputs to FVS/FFE computer model to determine a wildfire's flame length and intensity. We used the fuel models selected by FVS/FFE because they match what we see on the ground, and how we think a fire would behave.

Table 8. Existing and desired fuel models in stands proposed for treatment.

	Ponderosa pine stand	Douglas-fir stand	White fir stand
Current Fuel Model (from FVS/FFE)	10	10	12
Desired Fuel Model	9	8	8

Fires burn differently in the fuel models under the same weather conditions. During average fire conditions (not extreme), when dead fuel moisture averages eight percent, live fuel moisture is 100 percent, and the effective wind speed at mid-flame height is five miles per hour (mph) a fire in each of the fuel models will have the characteristics identified in Table 9.

Table 9: Predicted fire behavior in Fuel Models 8, 9, 10, and 12

Fuel Model	8	9	10	12
Flame Length (ft)	1 -2	2 - 3	4 - 5	7 – 8
Rate of Spread (ft/hr)	105	495	521	858

Torching and Crowning Indices

The torching index is the windspeed at which a fire will climb up into, torch, and usually kill individual or small groups of trees. The lower the windspeed necessary to cause torching, the higher the intensity of the fire. When conducting a prescribed burn, the Forest Service usually expects a certain amount of torching. FVS/FFE indicates torching by the descriptor "passive." In each of the three modeled stands, torching would occur at very low windspeeds because of the density and ladder-like structure of the fuels.

The crowning index is the windspeed at which a fire will travel through the crowns of trees, usually killing them. As with the torching index, a low crowning index represents a potentially severe wildfire. The Forest Service does not expect any crowning when conducting prescribed burns. FVS/FFE indicates crowning by the descriptor "active." Table 10 shows the torching and crowning index expected in each stand under existing conditions.

Table 10. Torching and crowning index expected in each stand under existing conditions in 97.5 percentile weather conditions.

Stand	Torching Index (miles per hour)	Crowning Index (miles per hour)
Ponderosa pine	0	12.3
Douglas-fir	5.8	12.5
White fir	0	13.3

Flame Length

Flame length is the distance measured from the tip of the flame to the middle of the flaming zone at the base of the fire. It is measured on a slant when the flames are tilted due to the effects of wind and slope (Figure 28).

Flame lengths affect firefighters' ability to suppress fires. At 4-foot flame lengths, hand crews generally are able to attack fires safely, while dozers may be used in fires having flame lengths up to eight feet. Flame length also indicates severity, since long flame lengths usually mean that a fire is in the crowns of trees.

We modeled flame lengths at the 90th and 97.5 percentile weather using FVS/FFE in each of the three stands under existing conditions.

With the exception of the Douglas-fir stand at 90th percentile weather, neither hand crews nor heavy ground equipment would be effective at suppressing a potential wildfire.

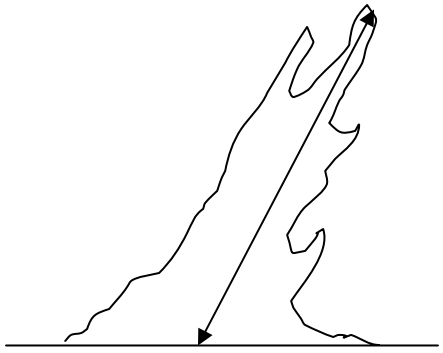


Figure 28. Measuring flame length.

Table 11. Predicted flame length at the 90th and 97.5 percentiles under existing conditions.

Stand	Flame length (feet)	
	90%	97.5%
Ponderosa pine	13.2	70.7
Douglas-fir	2.1	82.2
White fir	16.5	106.6

Surface Fuels

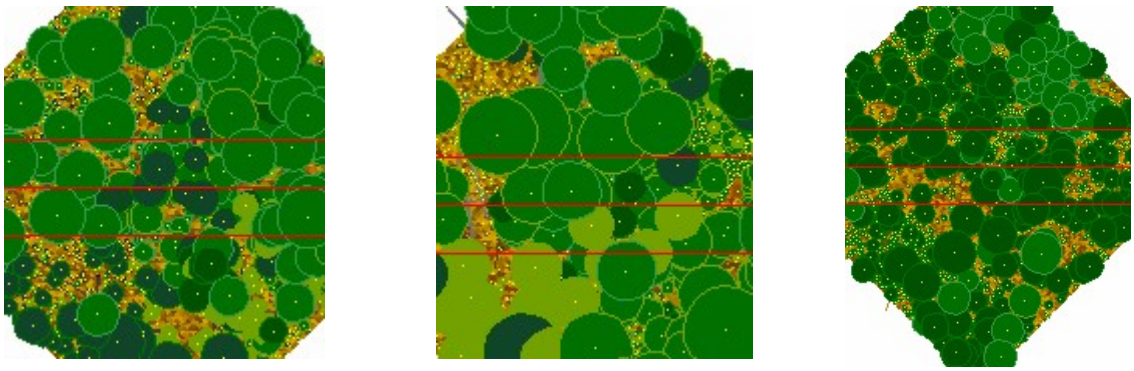
The dead and down fuel loading ranges from 5 to 13 tons per acre, averaging nine tons per acre. The surface fuel loading is gradually increasing because trees stressed from competition die and fall over. More trees are dying on the cooler north- and east-facing slopes in the mixed conifer, due to past spruce budworm attacks. Areas that were fuel model 8 are becoming a fuel model 10 (which has more branches and logs on the surface than a model 8) as the dead trees fall over and add to the fuel load.

Forest Structure

One factor affecting fire behavior is crown bulk density, which is the mass of crown fuel per unit of crown volume. A crown bulk density of 0.17 pounds per cubic yard (lb/yd^3) can sustain a crown fire (Agee 1996). From FVS/FFE, crown bulk densities in the three representative stands are as follows: Ponderosa pine = 0.30 lb/yd^3; Douglas-fir = 0.27 lb/yd^3; and White fir = 0.25 lb/yd^3.

Thus, these stands can sustain a crown fire. Many of the ponderosa pine stands have crown bulk densities up to 0.51 lb/yd^3, and mixed conifer would be even higher (silviculturalist's report).

Another factor affecting crown fire spread and intensity is canopy closure. Based on aerial photo interpretation, canopy closure averages 67 percent in the project area, with higher levels on north and east-facing slopes. At over approximately 40 percent canopy closure, trees are close enough together to support a crown fire (Van Wagtendonk 1996).



Douglas-fir stand White fir stand Ponderosa pine stand

Figure 29. Existing canopy closure in representative stands

VSS (Vegetation Structural Stage) characterizes a forest's developmental stages from grass-forb-shrub (VSS 1) to old forest (VSS 6). In the proposed treatment area, 97 percent of the mixed conifer remains in VSS 3, young forest; in ponderosa pine, it is 95 percent (silviculturalist's report). The remainder of the treatment area is VSS 4, mid-aged forest.

Basal area measures the total square footage of wood, in cross-section, at 4 ½ feet above breast height. Currently, the basal area of mixed conifer in the project area ranges from 170 to 200 square feet, and ponderosa pine ranges from 120 to 130 square feet. Both are considered high for this area (silviculturalist's report).

Stand Density Index (SDI) measures tree density by species. Currently, mixed conifer is estimated at 40 to 60 percent. In ponderosa pine, SDI averages between 60 and 70 percent. For both forest associations, SDI values above 35-40 percent are of concern to most forest biologists and entomologists because trees are more susceptible to insects and disease.

Ladder fuels are the small understory trees growing beneath larger trees, providing continuous vertical fuel arrangement that encourages crown fire initiation. One measure of ladder fuels is canopy base height, or the distance from the ground to the bottom of the tree crowns. Low canopy base heights have been shown to initiate crown fire behavior (Alexander 1988). In ponderosa pine, the base of the canopy generally begins at about 4 to 5 feet from the ground; in mixed conifer, crowns tend to be lower and even touch the ground (silviculturalist's report).

Table 12. Summary of existing forest structure in the project area.

	Mixed conifer	Ponderosa pine
Crown bulk density	~ 0.26 lb/yd3	~ 0.51 lb/yd3
Canopy cover	Closed	Closed
Vegetation Structural Stage	Young	Young
Basal area/acre	170-200 sq. ft.	120-130 sq. ft.
Stand Density Index	40-60%	60-70%
Insect & disease risk	High	High
Crown-to-base height	0 – 1 ft.	4 – 5 ft.
Trees per acre 1"+	700-800	700-800

Species Composition

The major forest types within the project area are:

- Mixed conifer (Primarily white fir – Douglas-fir; *Abies concolour - Pseudotsuga menziesii);*
- Ponderosa pine (*Pinus ponderosa*) with an abundance of white fir and Douglas-fir regeneration in the understory;
- Engelmann spruce – subalpine fir (*Picea engelmannii – Abies lasiocarpa*); and
- Quaking aspen (*Populus tremuloides*).

Since treatment in Engelmann spruce is limited to collection of dead and down wood and it won't change the basic forest structure, and no aspen will be treated, these will not be discussed. Outside the project area within the wilderness portion of the watershed, the major forest types are mixed conifer, spruce-fir and aspen.

Mixed Conifer: Mixed conifer represents the largest forest association within the watershed; nearly 50 percent of the project area is located in white fir and Douglas-fir cover types. Because

the Gallinas has not had periodic disturbances, shade-tolerant species are regenerating beneath less shade-tolerant species. Thus, the mixed conifer type is shifting toward a strong representation of white fir, especially in areas cool and moist enough to support it (silviculturalist's report).

The size and species distribution indicate a shift in species composition. Trees larger than 9 to 15 inches consist mostly of ponderosa pine, Douglas-fir, or a combination of the two. Very few white fir trees larger than 9 to 15 inches exist; however, the majority of trees less than nine inches are white fir. With continued absence of disturbance, white fir will continue to increase in stands currently classified as mixed conifer.

Ponderosa Pine: Similar to mixed conifer, ponderosa pine has a pronounced increase in the number of stems per acre in smaller diameter classes. Further, pine stands are being invaded by shade-tolerant fir trees. For instance, there are twice as many Douglas-fir seedlings than ponderosa pine seedlings in the pine representative stand (FVS runs, project record).

Figure 30. Existing condition of Douglas-fir stand.

Figure 31. Existing condition of white fir stand.

Figure 32. Existing condition of ponderosa pine stand.

Table 13. Trees per Acre by Diameter Class and Forest Type

Forest Type	Diameter Class (Inches)	Avg. Existing Trees/Acre
Mixed Conifer	0 to 5.9	1,390
	6.0 to 11.9	169
	12.0 to 17.9	37
	18.0+	8
Total		1,604
Ponderosa Pine	0 to 5.9	1,096
	6.0 to 11.9	135
	12.0 to 17.9	23
	18.0+	3
Total		1,257
Aspen	1.0 to 4.9	200
	5.0 to 8.9	270
	9.0 to 15.9	110
	16.0+	7
Total		587
Spruce/Fir	0 to 5.9	1,787
	6.0 to 11.9	161
	12.0 to 17.9	45
	18.0+	11
Total		2,004

This table summarizes the existing trees per acre by species and by size. Note that in all forest types, the vast majority of the stand is comprised of trees less than 6 inches.

Forest Vegetation, Fuels, and Fire Behavior – Environmental Consequences

Direct/Indirect Effects of Alternative 1 – No Action/No Wildfire

Potential for Escaped Fire: Since no prescribed burning would take place, there would be no potential for escaped fire from project activities.

Wildfire Behavior: Not applicable since we are assuming that no wildfire will occur in this scenario.

Fuel Models: Over time, all three major stand types would shift toward a fuel model 12. Trees would age, die, and fall over, leaving mostly heavy timber on the ground.

Torching and Crowning Indices: Not applicable since we are assuming that no wildfire will occur in this scenario.

Flame Length: Not applicable since we are assuming that no wildfire will occur in this scenario.

Surface Fuels: Surface fuels would increase over time. Litter, duff, twigs, and small branches would continue to accumulate. In addition, large surface fuels (greater than 3 inches in diameter) would greatly increase because of dead trees dying and falling over.

Forest Structure: The canopy bulk density in the forest would decrease over time because dead and fallen trees would reduce the mass of canopy.

Similarly, canopy closure is expected to gradually decrease over time because fallen trees would create openings in the overstory.

Based on current growth rates, most of the stands would not reach VSS 5 (18 inches or greater in diameter) for at least 2 decades. Some stands may remain in a VSS 3 or 4 for longer. Some stands may decrease in size class as larger, mature trees die and fall over, leaving the crowded, smaller trees.

The basal area would continue to increase, but at some point would begin to level off and stay constant barring any major disturbance. Infestations by insects and disease likely would cause occasional reductions in basal area. Dwarf-mistletoe can cause perpetually low basal areas until the stand is destroyed by fire.

Canopy base heights would not change from the existing condition because the main changes in the stands would be that the larger trees would die and fall over. The younger trees are so crowded that they are growing very slowly, so without disturbance the canopy base heights would not be raised.

Species Composition: The No Action encourages a species shift from ponderosa pine to mixed conifer, especially white fir. More white fir will increase a stand's susceptibility to defoliating insects such as spruce budworm. Repeated defoliation of the fir species can result in fir mortality that can add to the fuel loading within the mixed conifer stands, making the more fire adapted ponderosa pine susceptible to stand-replacing fires. High stocking levels in fir can also stress ponderosa pine, due to limited moisture and nutrients, making the pine more susceptible to bark beetle attack.

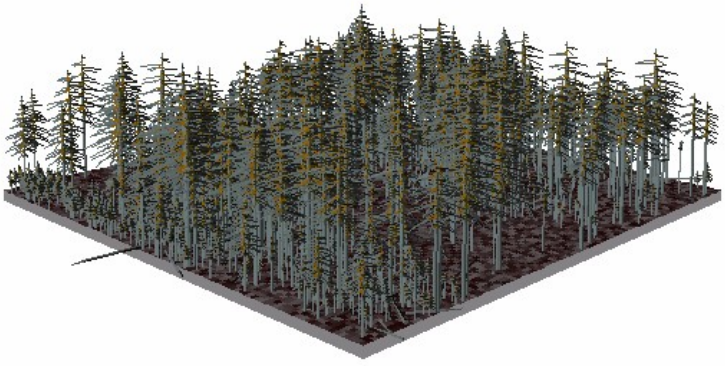


Figure 33. Ponderosa pine stand immediately following a wildfire in the 90th percentile weather condition (from FVS/FFE).

No Action with Wildfire

Wildfire Behavior: Using FVS/FFE, we assumed that a wildfire would occur in 2004 in the 90th percentile weather condition or greater. Under these conditions, fire behavior would be considered high intensity and high severity. This means that most trees and shrubs would be killed, and most of the surface fuels burnt to bare mineral soil. Many other wildfires have occurred in the last few years under similar conditions.

Table 14. Expected behavior under existing conditions as modeled by FVS/FFE.

Stand	Type of Fire	
	97.5 Percentile	90th Percentile
Ponderosa pine	Active	Passive
Douglas-fir	Active	Surface
White fir	Active	Passive

Some examples are the Viveash Fire (NM, 2000), the Cerro Grande Fire (NM, 2000), the Rodeo-Chediski Fire (AZ, 2002), the Hayman Fire (CO, 2002), and the Encedo Fire (NM, 2003). Figure 33 depicts how the ponderosa pine stand would look immediately following a wildfire. The other two stands had similar results – all trees were killed (FVS runs).

Table 14 shows expected wildfire behavior under existing conditions as modeled by FVS/FFE. By the year 2017, all stands would exhibit passive crown fires in the 90th percentile weather condition, and active crown fires in the 97th.

Fuel Models: In all stand types under existing conditions, a wildfire would kill most of the trees. For example, the Viveash Fire killed 70 percent of the trees it encountered. In the watershed, grass, oak brush, and aspen would be the first pioneers after such a fire. For the first 5 to 10 years, the fuel model would be either a grass or shrub model, depending on whether more grass or oak came back. Between 10 and 20 years when the dead trees begin falling over, the fuel model would be a timber model (11 or 12) (T. Gonzales, pers. comm., July 2003).

Torching and Crowning Indices: In the No Action/No Wildfire scenario, the torching and crowning indices would remain well below the desired threshold of 35 miles per hour in all three stand types, allowing a fire to travel easily from the surface to the crowns. In other words, light winds would be enough to cause torching or crowning during a wildfire. Figure 34 shows the FVS/FFE results for each of the three stands over time.

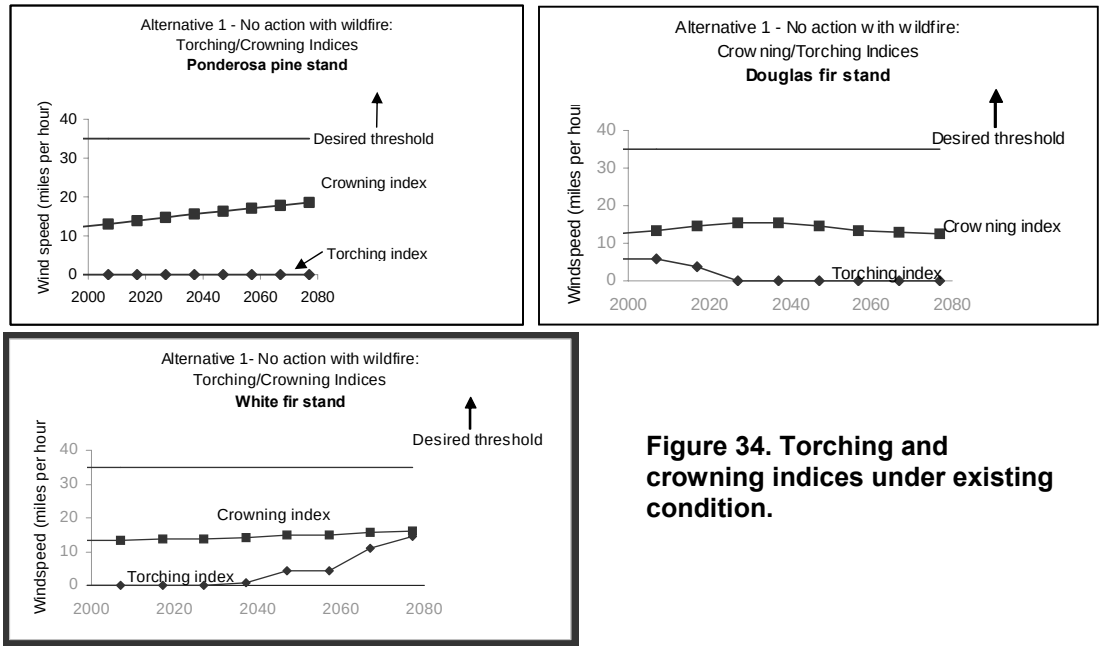
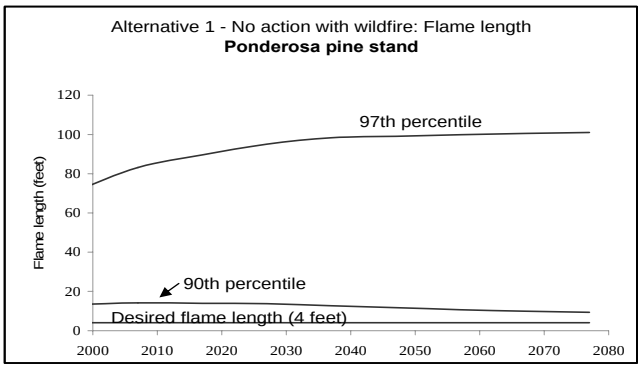
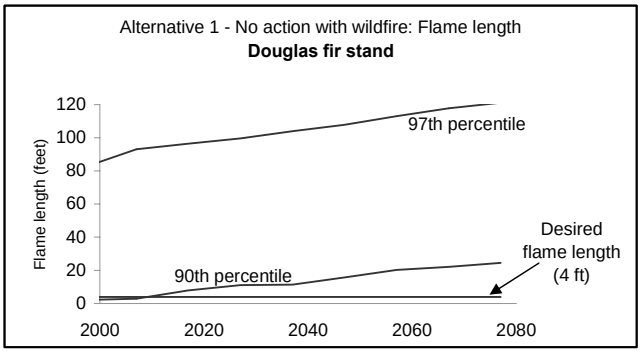


Figure 34. Torching and crowning indices under existing condition.

Flame Length: Without any treatment, flame lengths would exceed the desired height of 4 feet in all stands now and into the future. Figure 35 depicts the expected flame lengths as modeled by FVS/FFE.

Surface Fuels: No surface fuels would exist immediately following a high intensity wildfire because all the fuel would be consumed in the fire. After about 5 to 10 years, surface fuels would be comprised of grasses and shrubs. From 10 to 20 years, dead, fallen trees would add to the surface fuel loading. It is difficult to estimate the amount of surface fuels in tons per acre.





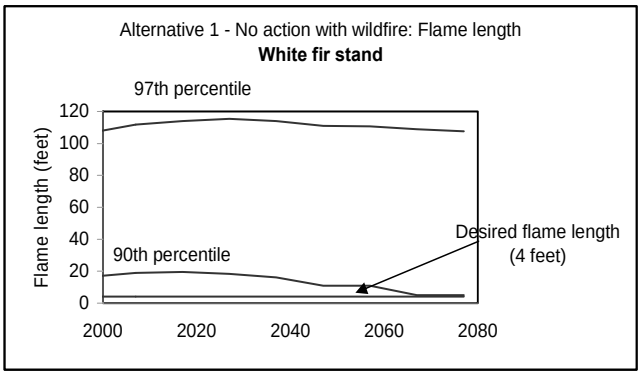


Figure 35. Predicted flame lengths under existing condition.

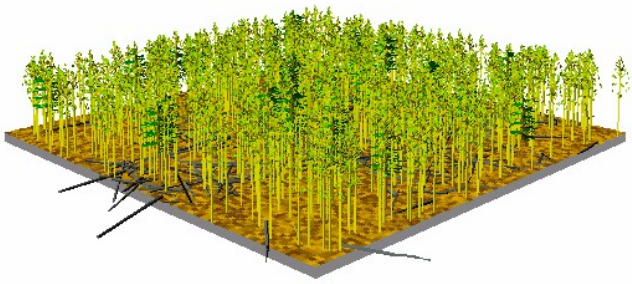
Table 15. Predicted fuel consumption during a wildfire in our three representative stands (fuel consumption in tons per acre).

Stand	Litter	Duff	0–3"	3"+	Herb & Shrub	Crowns	Total Consump-tion	Percent Trees with Crowning
Ponderosa pine	7.8	4.4	6	4.2	0.4	9	31.7	100
Douglas-fir	5.4	8	3.5	6.7	0.3	8.9	32.8	100
White fir	7.5	19.6	4.2	13.2	0.2	13.3	58	100

In addition to the high consumption of ground fuels, note that all the trees show crowning.

Forest Structure/Species Composition: After a high intensity wildfire, the stands in the forest would be set back to an earlier successional stage. FVS/FFE shows that all existing trees would be killed in the 90th percentile weather conditions; what comes back afterwards depends on the stand and the location of potential seed sources in nearby, unburned stands.

Ponderosa pine stand (above) regenerates mostly as Gambel oak.



Douglas-fir and white fir stands (above and below) regenerates primarily as aspen.

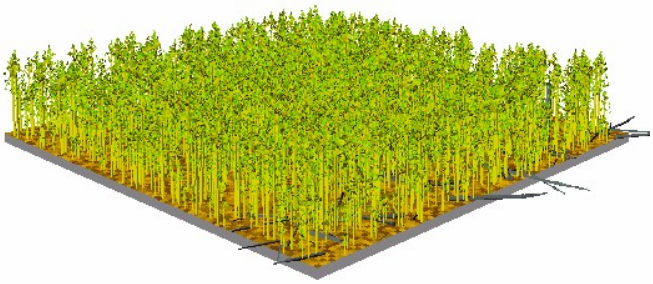


Figure 36. Post-wildfire regeneration under existing condition.

The canopy bulk density immediately after a wildfire would be close to zero because few, if any, live trees would remain. It would take 15 to 30 years to have a measurable canopy bulk density. Likewise, canopy closure would be almost zero after a wildfire until replaced by a new stand. The VSS class would be reset to 1 (openings). The basal area would decrease somewhat, but be comprised of standing dead trees. Since there would be no canopy, there would be no canopy base height.

If aspen is present in any stand, it is probable that it will dominate the regeneration along with grass and forbs. Ponderosa pine stands would most likely come back as Gambel oak. Douglas-fir and white fir also may be replaced by Gambel oak or aspen.

Direct/Indirect Effects of Alternative 2 – Proposed Action

Wildfire Behavior: A wildfire occurring shortly after stands had been treated would display much less aggressive behavior than in untreated stands. In all cases, FVS/FFE showed that wildfires would remain on the surface. We examined fire behavior over time by modeling periodic prescribed fires in each of the stands (every 10 years in ponderosa pine and every 20 years for mixed conifer). Fires remained on the surface with the maintenance burns; without them, regeneration grew in and caused fire behavior to become passive or active within 20 years.

Reduced wildfire behavior means that suppression forces would be better able to contain a fire in the watershed, resulting in less damage to water quality and property. Further, a wildfire would not kill the majority of the trees as shown in the following pictures below taken from FVS/FFE.

Fuel Models: After treatment, stands would return to their characteristic fuel models. FVS/FFE gave the ponderosa pine stand a fuel model 8 following treatment. Normally ponderosa pine is considered a fuel model 9; FVS/FFE most likely assigned it an 8 due to the presence of Douglas-fir in this particular stand. FVS/FFE assigned the Douglas-fir stand a fuel model 8, which we are likely to see on the ground. It gave the white fir stand, normally an 8, a fuel model 2 (grass model) because of the openness of the treated stand. We would expect to see white fir stands as fuel model 8 on the ground following treatment.

Treated (thinned and prescribed burned) ponderosa pine stand immediately after a wildfire (below).

Treated Douglas-fir stand after a wildfire (right).

Treated white fir stand after a wildfire (left).

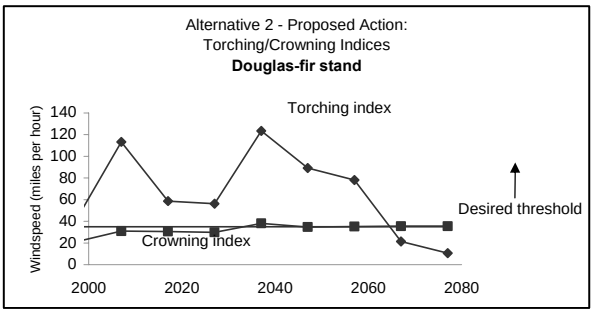
Figure 37. Predicted stand structure in treated stands following a wildfire.

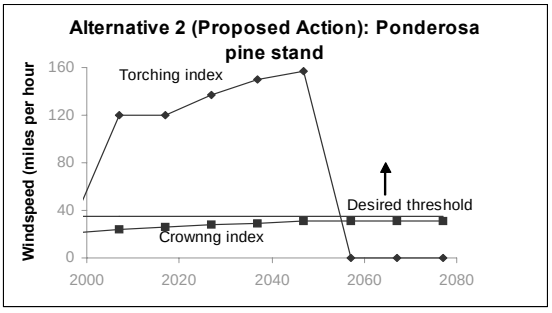
Torching and Crowning Indices: For the Proposed Action, the torching and crowning indices would be at or below the desired threshold of 35 miles per hour. This means that it would take a very strong wind to cause torching or crowning. In some graphs, the torching index is greater than

Table 16. Wildfire behavior in treated stands immediately following treatment

Stand	Fire Type	
	97.5 Percentile	90th Percentile
Ponderosa pine	Surface	Surface
Douglas-fir	Surface	Surface
White fir	Surface	Surface

the crowning index; this is a quirk of FVS/FFE. In this case, the number given for the crowning index is the wind speed needed to sustain a crown fire coming from outside of the stand. If the wind speed is less than the index, a fire will drop to the surface. Figure 38 shows the FVS/FFE results for each of the three stands over time.





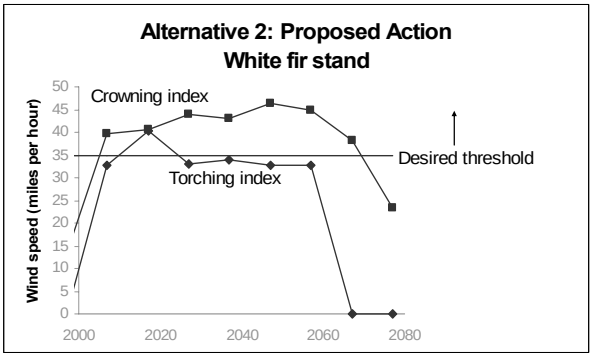


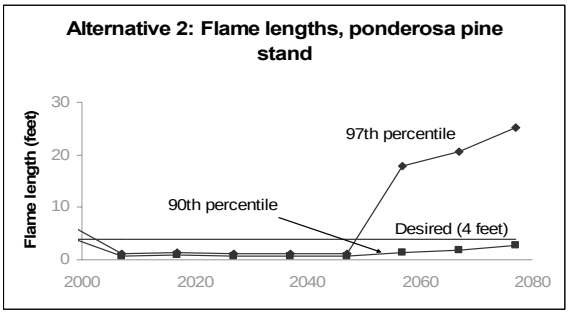
Figure 38. Predicted torching and crowning indices under Alternative 2 (Proposed Action).

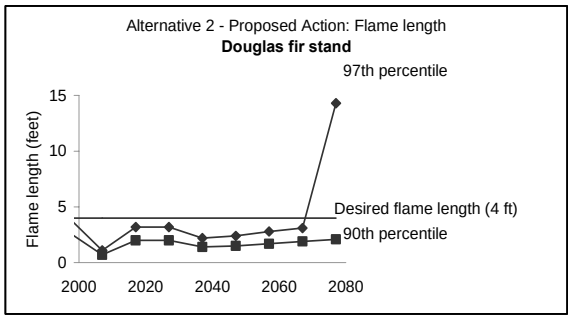
Flame Length: Under the Proposed Action, the flame lengths in each of the three stands would remain close to or below the desired 4-foot level. FVS/FFE showed that, in the ponderosa pine stand, flame lengths would be less than four feet with treatment and follow-up maintenance burns (see Figure 39). We did not incorporate prescribed burns into the model after the year 2050;

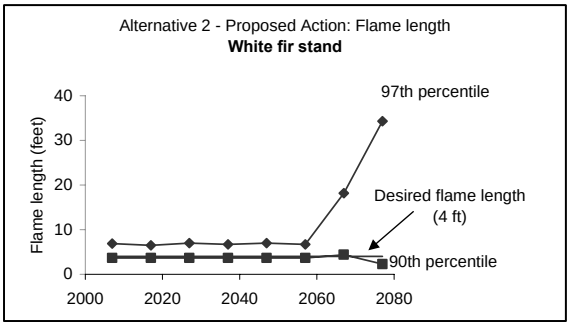
therefore, flame lengths rise due to young trees growing back. Note that flame lengths are not expected to exceed 30 feet as compared to almost 100 feet seen in the No Action Alternative.

The Douglas-fir stand (Figure 40) would behave similarly. Flame lengths would be below 4 feet as long as maintenance burns were periodically implemented. Again, the maximum predicted flame height would be no greater than 15 feet, whereas in the No Action Alternative, it would be almost 120 feet.

Flame lengths in the white fir stand would be less than 4 feet in 90th percentile weather conditions and less than 10 feet in the 97th percentile (see Figure 41). Again, this holds true as long as periodic prescribed burns are implemented.







Figures 39, 40 and 41. Predicted wildfire flame lengths under Alternative 2 (Proposed Action).

Surface Fuels: Under the Proposed Action, more surface fuels than crown fuels would be consumed in either a wildfire or a prescribed burn. Unless a wildfire occurred in the short window of time when slash was on the ground, a wildfire would remain on the surface, be cooler and, therefore, consume fewer fuels.

We modeled fuel consumption using FVS/FFE for prescribed burns. Our assumptions did not include collection of forest products; all wood was burned.

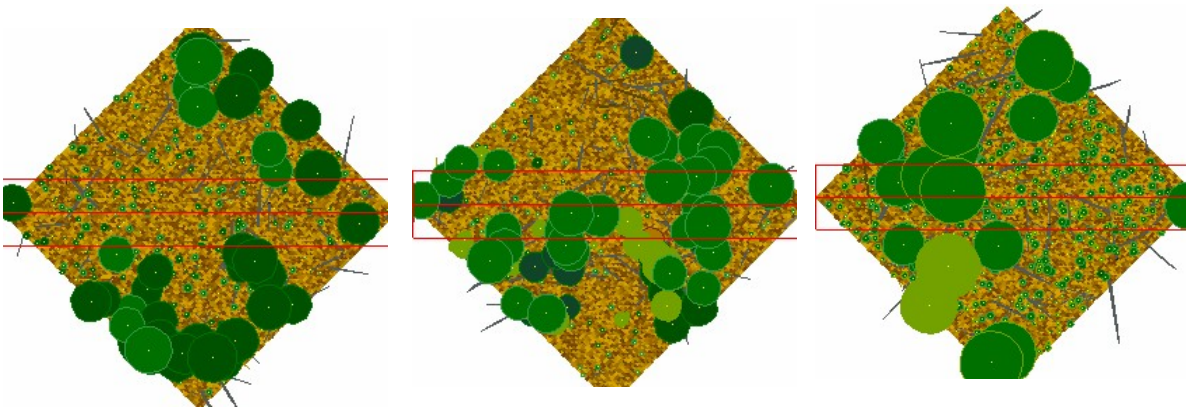
Table 17. Fuel consumption in tons per acre during prescribed burning.

Ponderosa pine stand								
Year of RX burn	Litter	Duff	0–3"	3"+	Herb and shrub	Crowns	Total consumption	Percent trees with crowning
2005	3.6	1.7	9.3	4.2	0.3	0.3	19.4	0
2010	1.7	1.2	3	2.6	0.3	0	8.9	0
2020	1.9	0.9	2.5	2.4	0.3	0	8.1	0
2030	2	0.6	1.5	2.3	0.3	0	6.8	0
2040	2	0.5	1.4	2.3	0.3	0	6.5	0
Douglas-fir stand								
2005	4.2	8.7	5.3	6.6	0.3	0.1	25.2	0
Year of RX burn	Litter	Duff	0–3"	3"+	Herb and shrub	Crowns	Total consumption	Percent trees with crowning
2027	2.5	1.7	2.9	6.1	0.3	0.1	13.5	0
White fir stand								
2005	11.4	21.3	17.6	14.4	0.5	0.4	65.5	0
2025	1.6	3.6	2.4	7	0.4	1.1	16	4
2045	1.4	0.7	1.8	4.6	0.5	0.6	9.8	6

In each stand, the most fuel is consumed during the first prescribed burn because there is a backlog of stuff on the ground. Subsequent burns are to maintain low fuel levels on the ground, so that is why less is burned. Note that almost none of the consumption is from crowning trees.

Forest Structure: Canopy bulk density would decrease by half or more under the Proposed Action and would not be enough to sustain a crown fire (FVS runs, project record).

Canopy closure would decrease greatly under the Proposed Action. Below are the FVS/FFE results for the three stands 50 years after treatment, including maintenance burns. Note the clumps of trees interspersed with open patches.



Ponderosa pine stand **Douglas-fir stand** **White fir stand**

Figure 42. Predicted canopy closure 50 years after treatment, including periodic prescribed burns.

VSS class would increase by one in thinned areas. For example, stands currently at a VSS 3 would become a VSS 4 immediately after thinning, and some of the VSS 4 stands would become VSS 5 immediately after thinning. The immediate increase in VSS size class would not result from tree growth; rather, removing the smallest trees from the stand will increase the average diameter of the remaining trees. It would take at least 30 years for the remaining trees to grow from one size class to the next.

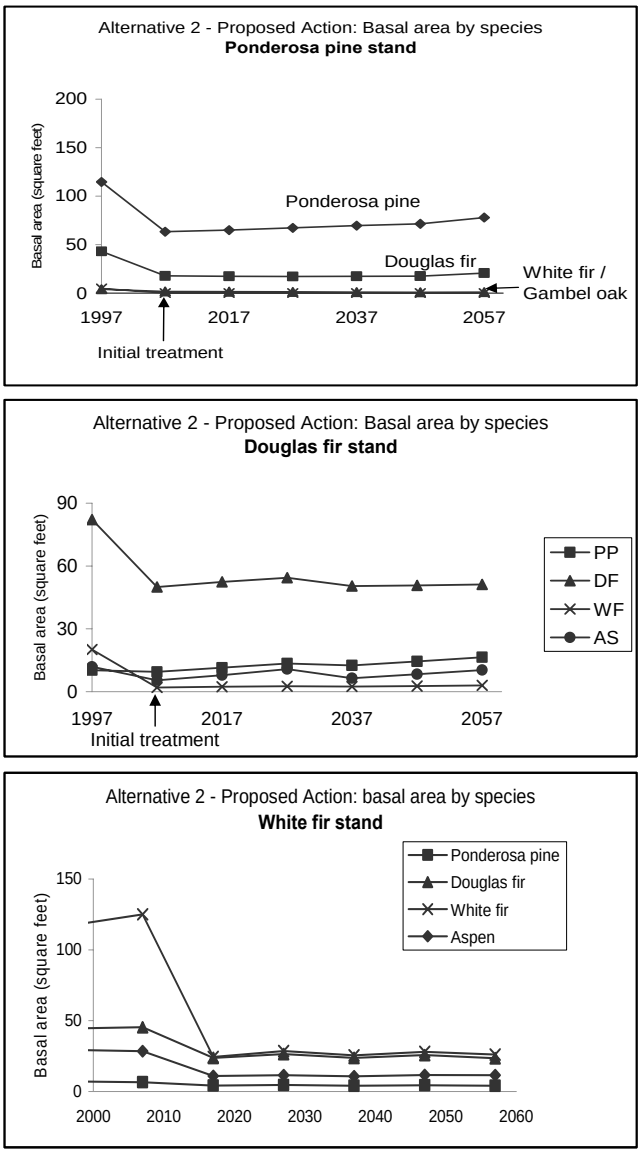


Figure 43. Predicted basal area by species over time under Alternative 2.

The graphs in Figure 43 show the basal area in each representative stand over time. Each stand has several species, so all species are shown. In all stands, the basal area is reduced greatly immediately after thinning. With follow-up prescribed burns, the basal area stays low over time.

The canopy base heights in all stands would remain above 10 feet as long as maintenance prescribed burns are implemented. In Figure 44, we modeled prescribed burns for about 50 years; beyond that, canopy base heights drop. Without maintenance burns, enough regeneration survives, which lowers the canopy base height and creates ladder fuels.

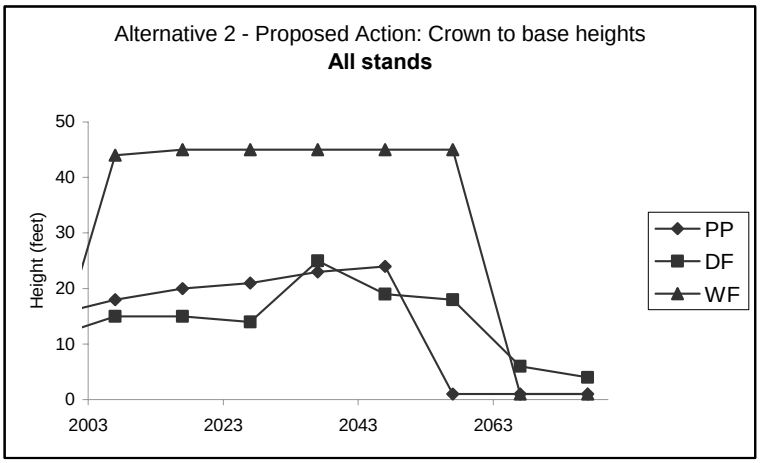


Figure 44. Predicted crown to base heights under Alternative 2.

Ponderosa pine stand (left) about 70 years after treatments.

Douglas-fir stand (left) about 70 years after treatments.

White fir stand (left) about 70 years after treatments.

Figure 45. Predicted future stand structures under Alternative 2.

Species Composition: Alternative 2 would reset stand succession to an earlier stage. Ponderosa pine and Douglas-fir would be favored over the late-successional, shade-tolerant, fire-intolerant white fir. Figure 45 illustrates what each of the representative stands would look like in about 70 years, including maintenance prescribed burns.

Potential for Escaped Fire: The Proposed Action would treat almost half of the project area. At the landscape level, the treatment patches would slow the forward spread rate of a fire because they overlap in the direction a fire would tend to spread (Finney 2001). Further, the treated areas would provide anchor points from which firefighters would be able to contain a wildfire. A wildfire that started in an untreated area, such as in the spruce-fir, would be able to spread into the wilderness. Approximately 3,280 acres would be broadcast burned without prior mechanical treatment.

Direct/Indirect Effects of Alternative 3 – More Thinning

At the stand level, the effects of Alternative 3 on forest vegetation and fuels would be the same as for the Proposed Action. The footprint of Alternative 3 is nearly the same as that of the Proposed Action; the fuelbreaks are a bit wider. Another difference is that about 2,100 acres would be thinned prior to burning, lowering the risk of escaped fire.

At the landscape level, the treatment patches would slow the forward spread rate of a fire because they overlap in the direction a fire would tend to spread (Finney 2001). Further, the treated areas would provide anchor points from which firefighters would be able to contain a wildfire. A wildfire that started in an untreated area, such as in the spruce-fir, would be able to spread into the wilderness.

Potential for Escaped Fire: About 1,200 acres would be broadcast burned without prior thinning, about 2,100 fewer than Alternative 2.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning

Potential for Escaped Fire: Alternative 4 treats the fewest number of acres of all the alternatives. No acres would be broadcast burned without prior thinning. Of the action alternatives, this one has the least potential for an escaped prescribed fire.

At the stand level, the effects of Alternative 4 on forest vegetation and fuels would be the same as for the Proposed Action. At the landscape level, Alternative 4 treats the fewest number of acres. Thus, it would be the least effective of the action alternatives at meeting the purpose and need. It would provide the fewest number of anchor points for suppression forces, the fewest fuelbreaks, and fewer areas where a wildfire would not crown in the 90th percentile weather conditions.

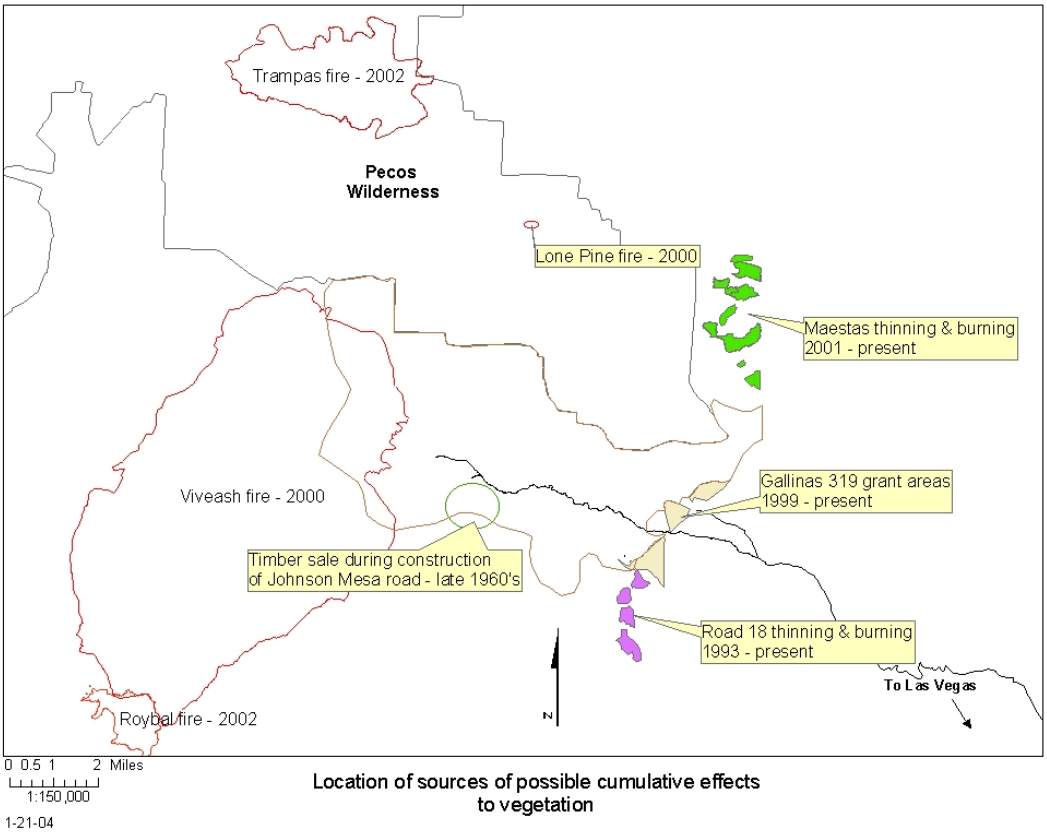


Figure 46. Location of sources of possible cumulative effects to vegetation.

Cumulative Effects to Forest Vegetation and Fuels

The geographic boundary for the cumulative effects to forest vegetation, fuels, and fire behavior is shown on Figure 46. The boundary includes the footprint of the Viveash Fire and the Pecos Wilderness. The past, present, and reasonably foreseeable future actions that could contribute to cumulative effects are the: Viveash Fire (2000), Roybal Fire (2002), Lone Pine Fire (2000), and Trampas Fire (2002); the Road 18 thinnings and prescribed burns; thinning and prescribed burning in Maestas; the Tecolote timber sale; the 319 watershed improvement projects; and natural attrition of aspens. All except the latter have (or will) reduced the amount of dense forest fuels, incrementally reducing the risk of a large, high-severity crown fire.

All of the action alternatives would serve to cumulatively reduce the risk of a high-severity crown fire at a landscape level. The action alternatives would also incrementally change forest structure at a landscape level, creating more openings and releasing larger trees. At a landscape level, there would still be a variety of forest types and densities; much of the watershed and the entire wilderness would not be treated. The action alternatives would encourage old growth forest rather than reduce it, so there would only be a cumulative net benefit or no change to the amount of old growth forest at a landscape level.

Other Resources: Environmental Consequences

Scenic Resources – Affected Environment

Specific areas from which project activities would be most noticeable are Forest Roads 156 and 263, Hermit's Peak, Johnson Mesa, and developed recreation areas.

The project area lies within Management Areas C and J, with the bulk of the units being in J. One of the three levels of "visual quality objective" (VQO) must be met, depending on the area:

- Retention - management activities are not evident to a forest visitor
- Partial Retention - management activities may be evident, but must be subordinate to the characteristic landscape
- Modification - management activities may dominate the characteristic landscape but must use naturally established form, line, color, and texture

The Forest Plan requires all resource activities in Management Area C to be managed for a VQO of Retention; Forest Road (FR) 156 is within this area. The VQOs in Management Area J are: Retention along Forest Road 263 adjacent to some private land and other areas visible in the foreground of Forest Road 263, Partial Retention near some parcels of private land, and Modification in other, smaller pockets. Management activities should appear as natural occurrences when viewed as middle ground or background (USDA Forest Service, 1974). The Forest Plan also requires that we develop a viewshed corridor plan during project planning (Forest Plan, p. 56); please refer to the project record for that document.

The existing character of the landscape ranges from heavily forested to less densely covered, depending on slope, aspect, and topography. From Johnson Mesa, one has a bird's-eye view of the project area and can see dense stands of mixed conifer with patches of oak and aspen. This uniform canopy is interrupted by natural openings dotted with groves and clumps of vegetation along ridge tops and hillsides. Rocky bluffs and outcrops are prominent throughout the area. The understory is particularly thick along Forest Road 263 and sections of Forest Road 156, creating an almost tunnel-like effect; in some places, views are limited to less than 10 feet off the road. In other stretches along Forest Road 156, vegetation and terrain open up to afford expansive and dramatic views of Hermit's Peak, El Cielo Mountain, and the eastern plains beyond Las Vegas.

Popular scenery-based activities include driving for pleasure, picnicking, camping, hiking, and to a certain extent, fishing. In addition, the Pecos/Las Vegas Ranger District has been encouraging use of Johnson Mesa for scenic viewing, especially during fall colors (Buehler, 2002). Visitors place a high value on the scenic quality and have an interest and concern in impacts to the resource.

Scenic Resources – Environmental Consequences

The evaluation criteria for direct and indirect effects to scenic resources will be:

- Immediate scenic effects of project activities
- Whether VQOs are being met throughout the project area

Direct/Indirect Effects of Alternative 1 – No Action: The VQOs would continue to be met under the No Action Alternative. The existing character of the landscape would change gradually over time with natural succession; the understory would develop and older trees would die. The desired character of the landscape described in Chapter 1 would not be achieved. There would be no opportunities to enhance and improve the scenic quality along Forest Roads 156 and 263 under this alternative since no vegetation would be treated.

No Action with Wildfire: Technically, a high-intensity, large-scale fire would not change the VQOs in the project area because fire is considered a natural part of the ecosystem. (VQOs only apply to human-driven projects.) Nonetheless, the existing character of the landscape would be suddenly and dramatically altered. The area would shift from densely forested to black, patchy, and open, depending on the severity of the fire. These changes would be visible in the foreground, middle ground, and background from Johnson Mesa, Hermit's Peak, private land, Forest Roads 156 and 263, the Na-Na-Ka Trail, and developed recreation sites. The effects would also be somewhat visible in the distance from areas outside the project area, such as Forest Road 18.

The landscape would have extensive, blackened areas. In addition, emergency fire suppression actions, such as fire lines and post-fire treatments, would result in unnatural scars on the landscape for 1 to 2 years. Within 2 or 3 years, grasses, shrubs, and aspen would regenerate. Opportunities for scenic viewing, particularly during fall color, would increase and improve with aspen regeneration.

Direct/Indirect Effects of Alternative 2 – Proposed Action: The VQOs of retention, partial retention, and modification would be met by this alternative, particularly because it would move the landscape toward the desired condition. Overall, the scenic quality would improve because the diversity of tree species, tree size, and their spatial distribution would increase. Thinning trees along Roads 156 and 263 would open views to Hermit's Peak, El Cielo Mountain, the eastern plains, and along Gallinas Creek. Treatments and associated effects are discussed below.

- **Thin from below, slash treatment, and wood removal:** Skid trails and piled or scattered slash in the foreground of forest roads, private lands, and recreation areas would result in a slight, short-term reduction of scenic quality. Skid trails would be rehabilitated and activity-generated slash would be removed within one year of project completion. Removing encroaching conifers in aspen stands and meadows would have an overall, long-term beneficial effect on scenic quality because there would be more fall color viewing, and meadows would add visual diversity and contrast to an otherwise forested setting.
- **Shaded fuelbreaks:** Fuelbreaks would not form a stark contrast with the rest of the landscape because their edges would be feathered to blend into adjacent, untreated stands, thereby avoiding harsh, unnatural lines. The fuelbreak along Forest Road 156 would occur within the immediate foreground and foreground zones of the road, expanding views and visual diversity by varying the spacing between trees, and drawing more attention to the interesting rock outcrops that are currently obscured by a dense understory. In addition, dramatic views of Hermit's Peak and El Cielo Mountain would be opened up. Fuelbreaks along ridge lines would primarily comprise middle ground and background views from Johnson Mesa and Hermit's Peak. From that distance, specific details of the fuelbreak and the reduction in canopy cover would not be noticeable. Rather, the uniform, dense cover of green would

appear slightly interrupted, creating a mosaic of pattern and color that would reflect similar forms and openings along other ridge lines and increasing visual interest.

- **Broadcast burning:** The effects of broadcast burning, such as blackened ground and red or black trees, would present a contrast to the otherwise green surroundings for about one season. They would be less noticeable within one or two growing seasons when grass, aspen, oak seedlings, and singed but not dead trees recovered.
- **Road maintenance:** Maintaining existing roads would not change scenic quality because the roads are already in place and only enough brush would be removed to make the road passable. Thus, no new unnatural lines would be created over the landscape.

Direct/Indirect Effects of Alternative 3 – More Thinning: As with Alternative 2, the VQOs would be met by this alternative.

- **Thin from below, slash treatment, and wood removal:** Skid trails and piled or scattered slash in the foreground of forest roads, private lands, and recreation areas would result in a slight, short-term reduction of scenic quality. Skid trails would be rehabilitated and activity-generated slash would be removed within one year of project completion. Removing encroaching conifers in aspen stands and meadows would have an overall, long-term beneficial effect on scenic quality because there would be more fall color viewing, and meadows would add visual diversity and contrast to an otherwise forested setting.
- **Shaded fuelbreaks:** Fuelbreaks would not form a stark contrast with the rest of the landscape because their edges would be feathered to blend into adjacent, untreated stands, thereby avoiding harsh, unnatural lines. The fuelbreak along Forest Road 156 would occur within the immediate foreground and foreground zones of the road, expanding views and visual diversity by varying the spacing between trees, and drawing more attention to the interesting rock outcrops that are currently obscured by a dense understory. In addition, dramatic views of Hermit's Peak and El Cielo Mountain would be opened up. Fuelbreaks along ridge lines would primarily comprise middle ground and background views from Johnson Mesa and Hermit's Peak. From that distance, specific details of the fuelbreak and the reduction in canopy cover would not be noticeable. Rather, the uniform, dense cover of green would appear slightly interrupted, creating a mosaic of pattern and color that would reflect similar forms and openings along other ridge lines and increasing visual interest.
- **Broadcast burning:** The effects of broadcast burning, such as blackened ground and red or black trees, would present a contrast to the otherwise green surroundings for about one season. They would be less noticeable within one or two growing seasons when grass, aspen, oak seedlings, and singed but not dead trees recovered.
- **Road maintenance:** Maintaining existing roads would not change scenic quality because the roads are already in place and only enough brush would be removed to make the road passable. Thus, no new unnatural lines would be created over the landscape.
- **Helicopter yarding:** Landings of at least one-half to one acre in size and piles of wood along Forest Road 156 would be very visible for the duration of the yarding activities (3 to 6 months). Because landings would be rehabilitated and activity-generated slash would be removed within 1 year of project completion, the visual effects would be short term. Converting the Gallinas Trailhead to a landing for

helicopter yarding would change it from rustic and forested to open and meadow-like, similar to existing openings located on private land below the trailhead. With the implementation of mitigation measures to rehabilitate the site, including recontouring, reseeding disturbed areas, and reestablishing the loop road, these effects would not be evident within one year after helicopter activities ceased.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: The VQOs of retention, partial retention, and modification would be met by this alternative, particularly because it would move the landscape toward the desired condition. Overall, the scenic quality would improve because the diversity of tree species, tree size, and their spatial distribution would increase. Thinning trees along Roads 156 and 263 would open views to Hermit's Peak, El Cielo Mountain, the eastern plains, and along Gallinas Creek. Treatments and associated effects are discussed below.

- **Thin from below, slash treatment, and wood removal:** Skid trails and piled or scattered slash in the foreground of forest roads, private lands, and recreation areas would result in a slight, short-term reduction of scenic quality. Skid trails would be rehabilitated and activity-generated slash would be removed within one year of project completion. Removing encroaching conifers in aspen stands and meadows would have an overall, long-term beneficial effect on scenic quality because there would be more fall color viewing, and meadows would add visual diversity and contrast to an otherwise forested setting.
- **Shaded fuelbreaks:** Fuelbreaks would not form a stark contrast with the rest of the landscape because their edges would be feathered to blend into adjacent, untreated stands, thereby avoiding harsh, unnatural lines. The fuelbreak along Forest Road 156 would occur within the immediate foreground and foreground zones of the road, expanding views and visual diversity by varying the spacing between trees, and drawing more attention to the interesting rock outcrops that are currently obscured by a dense understory. In addition, dramatic views of Hermit's Peak and El Cielo Mountain would be opened up. Fuelbreaks along ridge lines would primarily comprise middle ground and background views from Johnson Mesa and Hermit's Peak. From that distance, specific details of the fuelbreak and the reduction in canopy cover would not be noticeable. Rather, the uniform, dense cover of green would appear slightly interrupted, creating a mosaic of pattern and color that would reflect similar forms and openings along other ridge lines and increasing visual interest.
- **Broadcast burning:** The effects of broadcast burning, such as blackened ground and red or black trees, would present a contrast to the otherwise green surroundings for about one season. They would be less noticeable within one or two growing seasons when grass, aspen, oak seedlings, and singed but not dead trees recovered.
- **Road maintenance:** Maintaining existing roads would not change scenic quality because the roads are already in place and only enough brush would be removed to make the road passable. Thus, no new unnatural lines would be created over the landscape.

Cumulative Effects to Scenic Resources: The boundary for determining cumulative effects is the watershed and the Road 18 timber sale, adjacent to and south of the project area because this area contains the majority of viewpoints from which this project would be seen (see Figure 47). Past, present, and reasonably foreseeable future actions are the 319 watershed grants, thinning and prescribed burning in Maestas, and the Road 18 thinnings and prescribed burns.

As described above, the short-term effects from the project would be from slash, landing areas, trailhead alteration, and broadcast burning. Slash, landing areas, and the trailhead must be treated and/or restored within one year of project completion. The effects of broadcast burning would be evident for 1 or 2 years.

These short-term visual effects would not have a measurable cumulative effect with the other past, present, and reasonably foreseeable future actions. The 319 watershed grants were thinned between 1999 and 2002, and burned in the spring of 2003. Thus, slash from these projects is no longer evident, and the effects of the broadcast burn will disappear before this project begins. Similarly, about 120 acres of slash and natural fuels in the Road 18 timber sale area will be broadcast burned before any broadcast burning associated with this project would begin. Finally, thinning in the Maestas area started in 2001 and is expected to continue through the fall of 2003.

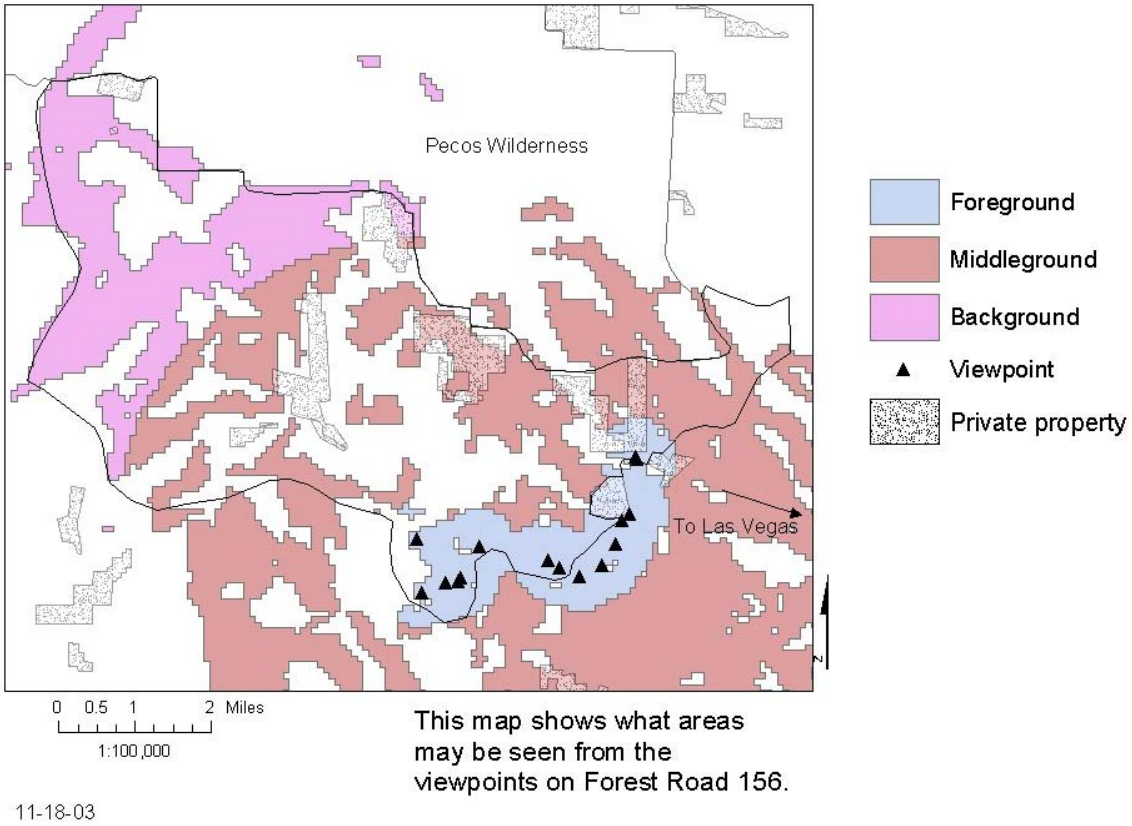


Figure 47. Viewpoints from Forest Road 156.

Portions of Maestas were burned in spring of 2003; burning is expected to be completed before any burning for this project begins. In summary, the visual effects of other projects will not overlap with those short-term effects for the proposed project.

Recreation - Affected Environment

Gallinas Canyon contains picnic areas, campgrounds, trailheads, summer recreational residence lots, and access to the Santa Fe National Forest. The campgrounds and day use areas are: El Porvenir Campground (13 sites), EV Long Campground (14 sites), Oak Flats Picnic Area (7 sites), Baker Flats Picnic Area (5 sites), and Big Pine Picnic Area (6 sites). Based on records in a Forest Service database, these developed sites typically have about 44,500 visitors during the managed season. This does not include the 1,000+ Recreational Visitor Days (RVDs) at the 18 recreation residences within the Gallinas Summer Home Group each year. A RVD represents one person spending eight hours on national forest land.

Scenic driving, cruising, picnicking, camping, fishing, and hiking are the most popular recreational activities. The campgrounds typically open for business at the end of April and close the first week of November. Picnic sites are used on warm days from February through November. Trailheads are accessible from late April through November. Dispersed camping and day use takes place off of Johnson Mesa Road and at Johnson Mesa Campground. This developed campground has been reduced through the years to a developed dispersed area with toilets but no other facilities. Johnson Mesa Campground is mostly used during the fall to observe color changes and for hunting. The Na-Na-Ka Trail starts west of Johnson Mesa and connects with the Skyline Trail.

All terrain vehicles (ATV), motorcycles, and mountain bicycles travel through the project area to get to roads outside of it, like the roads from the old Tecolote Timber Sale. This use has not been managed, so we are not sure how much takes place.

Recreation – Environmental Consequences

Direct/Indirect Effects of Alternative 1- No Action/No Wildfire: People would gradually have fewer places to ride off-road vehicles because densely spaced trees along roads would prevent access. Over a longer time span (10 to 30 years), the forest would grow old and trees would die. As trees die, they fall over. More trees would likely fall on roads and trails, requiring additional clearing and posing a safety hazard.

No Action with Wildfire: A high-severity wildfire could result in the complete loss of recreational residences, day use areas, and campgrounds. For Management Area J, the Forest Plan specifies that no new recreational facilities be constructed in the watershed (Forest Plan, p. 139). If facilities were not rebuilt, developed recreation opportunities in the watershed, accounting for approximately 44,500 user-days during the busy season (late April through early November), would be completely lost. At best, developed camping sites would take from 5 to 20 years to rebuild. For instance, the Cow Creek Campground destroyed in the Viveash Fire has not been rebuilt after 3 years and is not likely to be built in the near future due to a lack of funding. Some trails would have to be abandoned due to severe erosion, as happened in the Viveash Fire.

The loss of managed recreation would result in more unmanaged recreation, such as user-created campsites and trails. User-created sites cause other detrimental impacts, like erosion. User-created sites would most likely be found in easily accessible areas, near roads.

A wildfire would cause accelerated maintenance of roads and trails because dead trees would fall across them, especially for the first 5 to 7 years. Falling dead trees also pose a safety hazard.

Hunting opportunities would decrease for about one season after a fire because game would have left the area or been killed by the fire. Over the long term, hunting opportunities would increase because game, such as elk, would be attracted to the aspen as a food source.

Fishing could not take place for approximately 3 to 5 years following a severe wildfire. The heavy loads of ash and sediment washing into streams after a fire kill fish (refer to the fish section). Streams in the watershed could be restocked after sediment levels dropped, several years after the fire. For instance, Cow Creek was stocked for the first time 3 years after the Viveash Fire.

Direct/Indirect Effects of Alternative 2 – Proposed Action:

Trails: Trails would have to be temporarily closed during project implementation, resulting in user displacement and dissatisfaction. The district considers trail use in this area to be low, about 200 people per year on all trails combined (Buehler, pers. comm. 2003). Specific effects to each trail are:

- Na Na Ka Trail would be closed for 2 to 3 seasons during project implementation and rehabilitation. Off-road vehicles may encroach before the trail is rehabilitated.
- Hermit's Peak, Western Life, and Evergreen Valley Trails would be closed for 2 to 3 months during thinning and up to two weeks during prescribed burning.
- Burro Trail would be closed for up to two weeks during prescribed burning.

Campgrounds: El Porvenir and EV Long would be closed for up to one month each, but not at the same time, in the off-season (October through April). The district estimates their use in the off-season to be very low, about 60 RVDs per month. If project implementation takes place in the busy season, campgrounds would close for up to one month, eliminating approximately 3,900 RVDs.

Day Use and Other Areas: All day-use areas (Baker Flat, Oak Flat, and Big Pine) would be closed at the same time for up to three months. During the busy season, this would eliminate about 4,800 RVDs. During the off-season, it would eliminate an estimated 180 RVDs.

Recreation residences along Gallinas Creek and private property in Calf Canyon, Evergreen Valley, and the El Porvenir Christian Camp would not hear noise from thinning if it occurred during the off-season since most people are not present at this time. If thinning occurred during the busy season, the 18 recreation residences (about 1,000 RVDs) would hear noise from the project (chain saws, chippers) for up to three months.

It would take about 1 year after project implementation before skid trails could be rehabilitated. People may drive off-road on the skid trails before they are rehabilitated, creating unmanaged motorized use and conflicts with other uses.

Where there is public collection of firewood, there will likely be an increase in litter, increasing cleanup costs and detracting from visual quality.

Roads would be closed for one day when thinning takes place along them.

Direct/Indirect/Cumulative Effects of Alternative 3 – More Thinning: The effects from Alternative 3 would be the same as for Alternative 2, except that Gallinas Trailhead would be

closed for 2 to 4 months during helicopter operations and another month while the trailhead would be rehabilitated.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning:

- **Trails**: One trail would have to be temporarily closed during project implementation, resulting in user displacement and dissatisfaction:
  - The Na Na Ka trail would be closed for 2 to 3 seasons during project implementation and rehabilitation. Off-road vehicles may encroach before the trail is rehabilitated.
- **Day Use and Other Areas:** Day-use areas (Baker Flat, Oak Flat, and Big Pine) would be closed at the same time for up to three months. During the busy season, this would eliminate about 4,800 RVDs. During the off-season, it would eliminate about 180 RVDs.

  Recreation residences along Gallinas Creek and private property in Calf Canyon, Evergreen Valley, and the El Porvenir Christian Camp would not hear noise from thinning if it occurred during the off-season since most people are not present at this time. If thinning occurred during the busy season, the 18 recreation residences (about 1,000 RVDs) would hear noise for up to three months.

  It would take about one year after project implementation before skid trails could be rehabilitated. People may drive off-road on the skid trails before they are rehabilitated, creating unmanaged motorized use and conflicts with other uses.

  Where there is public collection of firewood, there will likely be an increase in litter, increasing cleanup costs and detracting from visual quality.

  Roads would be closed for up to one day when thinning takes place along them.

Cumulative Effects to Recreation: The analysis area for determining the cumulative effects was the east side of the forest. Cumulatively, a wildfire in the watershed could result in complete loss of all developed camping on the Las Vegas side of the forest. Four developed sites in Cow Creek and almost all dispersed sites in the area were lost in the Viveash Fire; El Porvenir and EV Long could be lost in a fire in Gallinas Canyon. Further, about four miles of the Skyline Trail were destroyed in the Viveash Fire. Any loss of trails in Gallinas would result in fewer hiking opportunities on the east side of the forest.

None of the action alternatives would cause cumulative effects to recreation because there are no past, present, or reasonably foreseeable future actions on the east side of the district whose effects would overlap with the effects from this project. In other words, the only closures anticipated on the east side would be associated with this project; no other restrictions or closures are foreseen.

Heritage Resources – Affected Environment

The full text and rationale of the archeologist's report is located in the project record. The Forest Plan requires that we survey and protect heritage resources, assess the effects of proposed projects on heritage resources, and consult with the State Historic Preservation Office (SHPO) and Native American tribes (pp 19, 60-61).

Twenty-eight archaeological sites and historic properties have been recorded in the watershed. Eighteen summer homes and associated buildings of possible historic age are also located in the

canyon bottom. While the historic status of these structures has not yet been assessed, all are potentially historic. Portions of one traditional cultural property fall within the watershed.

Archeological survey would be conducted before any treatments are implemented pursuant to the Forest Service's Programmatic Agreement with the SHPO. In addition, all potentially historic summer homes would be evaluated.

Heritage Resources – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: No ground-disturbing or burning activities would take place; therefore, this action would have no effect on heritage resources.

No Action with Wildfire: A wildfire in the watershed under the No Action Alternative poses one of the greatest risks to heritage resources. All heritage sites in and surrounding the watershed could be damaged or destroyed by a large, high-severity crown fire and its after-effects. Combustible portions of archeological remains and historic structures could be partially or completely consumed by fire. Non-combustible materials, such as the remains of stone tools, masonry architecture and metal artifacts, could become blackened or glazed; these materials would also spall and melt, changing their physical or chemical composition irreversibly.

Impacts to heritage sites would also occur during the suppression and after-effects of a high-severity wildfire. The use of bulldozers and hand tools to construct fire containment line would damage or destroy the subsurface deposits of an archeological site, and the surface features of archeological sites and historic properties. The use of water and fire retardant from engines and aircraft may also cause damage, particularly to historic structures. The removal of vegetation by wildfire can result in the exposure of bare surfaces and greatly accelerate erosion. Excessive erosion following a wildfire would damage or destroy heritage resources because archaeological deposits would be displaced or completely removed. Historic structures would be inundated, buried, and structurally undermined by the increased sediment loads carried in streams and intermittent drainages. Flooding and other erosion could damage or destroy trails to the traditional cultural property, creating a short-term or long-term loss of access to the property by members of the community. Dead trees could fall across the trail and block access to the traditional cultural property.

Direct/Indirect Effects of Alternative 2 – Proposed Action: The Proposed Action would not damage or destroy heritage resources since the Forest Service would follow the mitigation measures listed in Chapter 2.

- **Thinning from below** would not disturb heritage sites because cutting small trees using chain saws does not disturb the ground. Further, trees would be felled away from heritage sites, avoiding any damage to the site. The mitigation measures described for thinning in the vicinity of the potentially historic summer homes may improve the historic character of the viewshed and setting of these homes by removing small trees inconsistent with historic vegetation patterns, by leaving large trees and other vegetation consistent with historic patterns, and by promoting a more open, park-like and domestic setting in the vicinity of homes.
- **Forest product collection** would not disturb heritage sites because forest products within archeological sites would be hand-carried, rather than dragged, off of the site.

Pickup and/or small commercial trucks, another possible source of disturbance, would not be allowed in heritage sites.

- **Pile burning** would not be permitted in or near heritage resource site boundaries, so pile burning would not affect sites either directly or indirectly, such as from floating embers.
- **Broadcast burning** would not affect heritage resource sites. Sites would be avoided, or perishable remains would be protected. Broadcast burning may take place within some archeological sites if the sites have no flammable remains, if the fuel loads on the sites are low or if fuels can be removed from the sites, and if the overall fuel loading of the area to be burned is within an acceptable level to avoid damage to the sites. Because prescribed burning would not occur around the trail to the traditional cultural property during sensitive holidays (see mitigation in Chapter 2), smoke would not disrupt community and individual activities associated with the use of the traditional cultural property.
- **Road maintenance** would not damage sites because sites would be identified and avoided.

Direct/Indirect Effects of Alternative 3 – More Thinning: This alternative proposes the same ground disturbing and burning activities as are listed for the Proposed Action. Alternative 3 would not damage or destroy heritage resources since the Forest Service would follow the mitigation measures listed in Chapter 2.

Alternative 3, like the Proposed Action, includes thinning from below, the collection of forest products, pile burning, and broadcast burning. In addition, Alternative 3 proposes to remove forest products by helicopter yarding.

- **Thinning from below** would not disturb heritage sites because cutting small trees using chain saws does not disturb the ground. Further, trees would be felled away from heritage sites, avoiding any damage to the site. The mitigation measures described for thinning in the vicinity of the potentially historic summer homes may improve the historic character of the viewshed and setting of these homes by removing small trees inconsistent with historic vegetation patterns, by leaving large trees and other vegetation consistent with historic patterns, and by promoting a more open, park-like and domestic setting in the vicinity of homes.
- **Forest product collection** would not disturb heritage sites because forest products within archeological sites would be hand-carried, rather than dragged, off of the site. Pickup and/or small commercial trucks, another possible source of disturbance, would not be allowed in heritage sites.
- **Pile burning** would not be permitted in or near heritage resource site boundaries, so pile burning would not affect sites either directly or indirectly, such as from floating embers.
- **Broadcast burning** would not affect heritage resource sites. Sites would be avoided, or perishable remains would be protected. Broadcast burning may take place within some archeological sites if the sites have no flammable remains, if the fuel loads on the sites are low or if fuels can be removed from the sites, and if the overall fuel loading of the area to be burned is within an acceptable level to avoid damage to the sites. Because prescribed burning would not occur around the trail to the traditional cultural property during sensitive holidays (see mitigation in Chapter 2), smoke

would not disrupt community and individual activities associated with the use of the traditional cultural property.

- **Forest product removal and yarding by helicopter** would not disturb archeological sites because trees would be lifted directly upward with no dragging along the ground. Landings would not be constructed in or near the boundaries of an archeological site, thereby avoiding sites.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Alternative 4 proposes the same types of ground disturbing and burning activities listed for the Proposed Action. Alternative 4 would not damage or destroy heritage resources because the Forest Service would follow the mitigation measures listed in Chapter 2.

- **Thinning from below** would not disturb heritage sites because cutting small trees using chain saws does not disturb the ground. Further, trees would be felled away from heritage sites, avoiding any damage to the site. The mitigation measures described for thinning in the vicinity of the potentially historic summer homes may improve the historic character of the viewshed and setting of these homes by removing small trees inconsistent with historic vegetation patterns, by leaving large trees and other vegetation consistent with historic patterns, and by promoting a more open, park-like and domestic setting in the vicinity of the homes.
- **Forest product collection** would not disturb heritage sites because forest products within archeological sites would be hand-carried, rather than dragged, off of the site. Pickup and/or small commercial trucks, another possible source of disturbance, would not be allowed in heritage sites.
- **Pile burning** would not be permitted in or near heritage resource site boundaries, so pile burning would not affect sites either directly or indirectly, such as from floating embers.
- **Broadcast burning** would not affect heritage resource sites. Sites would be avoided, or perishable remains would be protected. Broadcast burning may take place within some archeological sites if the sites have no flammable remains, if the fuel loads on the sites are low or if fuels can be removed from the sites, and if the overall fuel loading of the area to be burned is within an acceptable level to avoid damage to the sites. Because prescribed burning would not occur around the trail to the traditional cultural property during sensitive holidays (see mitigation in Chapter 2), smoke would not disrupt community and individual activities associated with the use of the traditional cultural property.

Cumulative Effects to Heritage Resources: The No Action with wildfire alternative would cause a cumulative loss of heritage resources when considered with those lost in the Viveash Fire. Thirty historic sites were damaged by burning, the construction of fire containment lines by bulldozers, and from subsequent erosion. Six historic sites, including cabins and remains from logging and mining operations, were completely destroyed by burning and subsequent erosion. The damage and destruction to these heritage sites represents a great loss to our potential to understand prehistoric Native American uses of the southern Sangre de Cristo Mountains, such as hunting, gathering, and religious/ceremonial practices. It also represents a loss to our potential to learn about the history of historic land uses in the area. These uses included traditional Hispanic homesteading, ranching and herding activities, and commercial activities, such as logging and mining, which are important to the economic history of New Mexico and the United States.

Because the action alternatives would meet or exceed directives for preservation of heritage resources, there would be no damaging cumulative effects.

Social - Affected Environment

Income/Poverty: Several small villages (El Porvenir, Gallinas, Trout Springs, Montezuma, Los Vigiles, and El Llano) could be affected by project activities. The largest community closest to the project area is Las Vegas. The project area is located in San Miguel County.

For the year 2000, the per capita personal income in San Miguel County was $16,205 (up from $10,586 in 1990). The per capita income in San Miguel County is below both the national figure of $21,690 and the state figure of $17,067. The distribution of annual income for the year 2000 in the county is depicted in Figure 48.

The sectors employing the greatest number of people in the county are state government, local government, and retail trade, respectively. Only 57 jobs in agriculture, forestry, fishing, and hunting combined currently exist. Further, the average weekly salary for these jobs ($302) is amongst the lowest of 23 sectors listed. It is likely that more than 57 people make a living from forestry-related activities, but they are probably making a living “off the books” by working for themselves. It is difficult to estimate the number of people doing this or the amount of money that they earn.

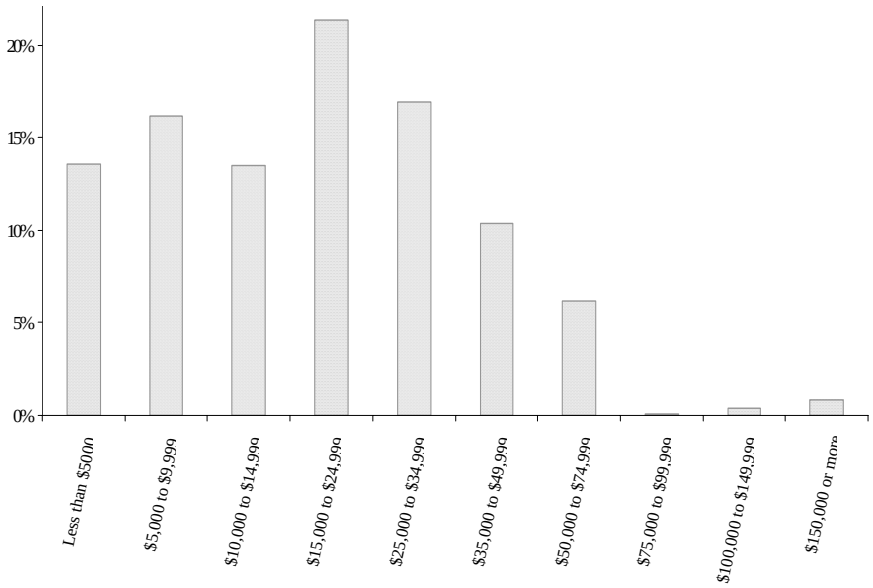


Figure 48. Distribution of annual income, San Miguel County, 2000.

Three counties abut the Pecos/Las Vegas Ranger District: San Miguel, Santa Fe, and Mora Counties. Of these, San Miguel County has the second highest rate of unemployment. Figure 49 compares the unemployment rates of the adjacent counties with those of the state and the nation for the last decade.

Unemployment figures for San Miguel County may well be diluted by Pecos; a fair number of residents live in Pecos and commute to Santa Fe. As of March 2002, the unemployment rate for San Miguel County was 6.6 percent.

San Miguel County can be considered an impoverished county; just over 30 percent of the population lives below the poverty level. This compares to the state of New Mexico, which has 18 percent of the population below the poverty level, and the nationwide figure of 12.5 percent.

Wood Supply: The demand for wood on the east side of the district is greater than the supply; as soon as wood is available for personal use, it is quickly picked over (Michael Lujan, personal communication 9-18-02).

Noise: Noise in the watershed is minimal. The great majority of the watershed is very quiet;

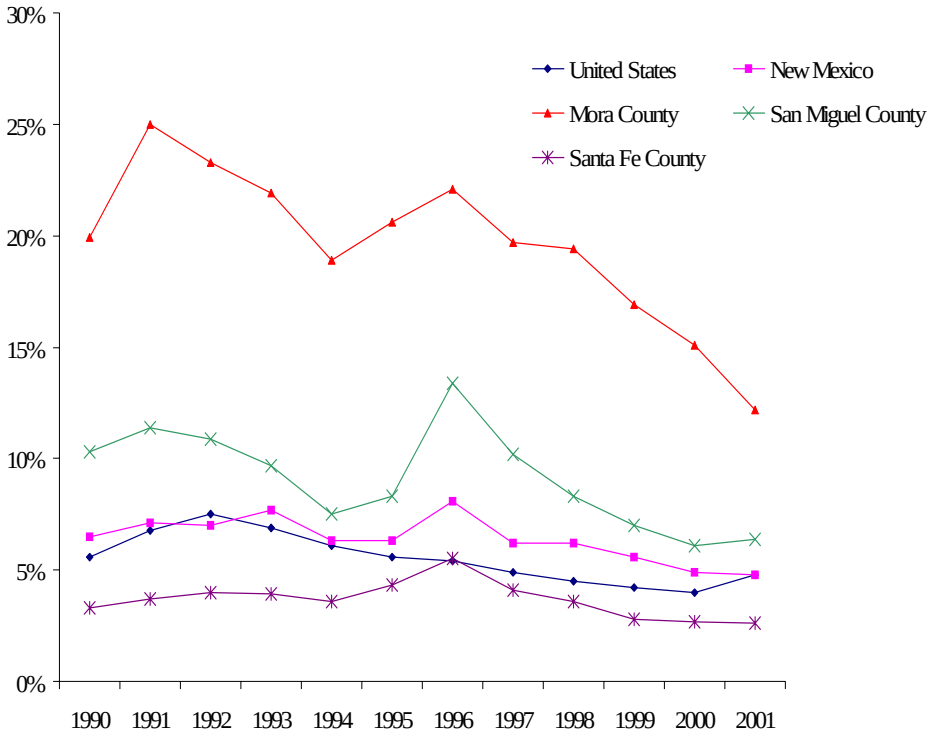


Figure 49. Comparison of poverty levels over time.

birds, running water, and wind in the trees comprise the bulk of the noise. People create noise in the vicinity of day-use areas and campgrounds. Along roads, vehicles cause noise intermittently.

Safety: At present, there is little risk of injury from trees falling on someone or across the road. Live trees are not very susceptible to falling because their root system holds them in place. There is little risk of automobile accidents since few cars travel in the watershed and visibility is excellent nearly every day. The Forest Service does little prescribed burning near the watershed, so the risk of severe smoke inhalation is almost nonexistent.

Environmental Justice: Executive Order 12898 (February 11, 1994) directs Federal agencies to focus on environmental conditions in minority and low-income communities. The purpose of the order is to ensure that these communities do not bear disproportionately adverse environmental effects from Federal actions.

The communities near the project area are susceptible to high-severity fires due to overstocked forests.

Social – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire:

- **Economic Impacts:** Because thinning projects would not be implemented, no additional workers would be needed. Neither the number of forestry-related jobs or per capita income would be changed because no income from project-related work would be generated. The amount of firewood, latillas, and vigas may or may not meet the public demand, depending on the severity of the winter and the availability of wood products.
- **Cost-Benefit Analysis:** There would be no cost to implement this alternative; only regular maintenance activities would continue in the watershed. There also would be no benefits, such as the availability of firewood, better protection from wildfire, or improved scenic views.
- **Noise:** Under the No Action Alternative, there would be no change from the existing condition just described.
- **Safety:** Under the No Action Alternative, there would be no change from the existing condition just described.
- **Environmental Justice:** Under the No Action Alternative, there would be no change from the existing condition just described.

No Action with Wildfire:

- **Economic Impacts:** Only a small fraction of workers in San Miguel County, such as the Southwest Firefighter crews, would have increased salaries as a direct result of a wildfire. Local businesses could also earn slightly more money by providing support such as meals. Neither the Forest Service, New Mexico State Forestry, nor local firefighting units would create additional permanent positions as a result of a wildfire. Since the Gallinas is a municipal watershed, the Forest Service would not salvage logs. Thus, no forestry-related jobs or income would be generated. For these reasons, the overall effect of a high-severity wildfire on the income and poverty level in San Miguel County would not be measurable.

  A wildfire in the watershed would not generate additional firewood, latillas, and vigas for public consumption because the Forest Service would not salvage logs in a municipal watershed. If the wildfire burned on Johnson Mesa, there could be an opportunity to salvage logs.
- **Cost-Benefit Analysis:** The cost to suppress a wildfire can be up to $7,000 per acre, depending on the resources available and the values at risk. Because Gallinas Creek is the sole water supply for Las Vegas and because homes are located within the watershed, we would expect high suppression and rehabilitation costs associated with

a large, high-severity fire. The city would incur costs treating water heavy with sediment and ash. Private landowners could lose structures or see decreased property values.

- **Noise:** Fire engines, light trucks, helicopters, and airplanes would all cause noise during the suppression of a fire. The noise from this equipment would sound as loud as a road construction site. The noise from ground-based equipment would be limited to the immediate area in which it is located, while that from aircraft (helicopters and planes) would be heard over a broad area, depending on the size of the aircraft and the distance it flies. Suppression efforts can last up to a month, so the noise would be limited in duration.
- **Safety:** A wildfire presents hazards like injury and loss of life. Firefighters and residents could be injured or killed during a severe wildfire. During the 2002 fire season, 21 firefighters died in wildfire-related accidents. In the first couple of years after a fire, residents could be injured or killed during post-fire flooding. Over the long term, there is a slight risk that people moving about a burned forest could be injured or killed by dead trees falling over. Residents in the region would have respiratory problems from a wildfire's smoke, much like occurred during the Cerro Grande Fire of 2000 (discussed in detail in the Air Quality section).
- **Environmental Justice:** Over the short term, nearby communities would bear the negative effects of smoke and suppression tactics, like having slurry dropped on their property or losing their houses. Over the long term, they would suffer economically since many make a living off of forest products.

Direct/Indirect Effects of Alternative 2 - Proposed Action:

- **Economic Impacts:** The Proposed Action would increase the income of a few people in Las Vegas and San Miguel County, but not enough to change their overall economic status. Local people hired to perform thinning would see an increased income for as long as they worked on the project, but the number of workers would not be more than 30 at a time based on our experience with other projects.

  The Proposed Action would provide about 25,500 cords of firewood over five years. This would be a substantial increase from what is available currently, and would provide a reliable supply of wood for five years or more.

- **Cost-Benefit Analysis:** Treatment costs may range from $100 to $900 per acre (Romero, pers. comm.). This project would not pay for itself since most of the wood removed would be small in diameter, and the Forest Service would have to pay to have trees thinned and removed. The benefits associated with the Proposed Action would be: reduced risk of large, high-severity wildfire, a steady and plentiful supply of firewood and vigas, better scenic views, reduced risk of water contamination from ash and sediment, and reduced costs when compared to suppression costs.
- **Noise:** Noise from the Proposed Action would be caused by chain saws, ground-based logging equipment, and increased traffic. The noise from each drops dramatically with distance. For example, chain saw noise is about 100 decibels from the operator's position, but cannot be heard from more than a quarter mile away in most circumstances (T. Gonzales, pers. comm.).

  By limiting the use of all thinning equipment around developed recreational areas and residences from Memorial Day to Labor Day, most people would not hear

project-related noise. Noise away from developed recreational areas from chain saws would be limited in duration and extent since crews would work in areas for only a short period of time; a 4-person crew would thin 100 acres in about 25 days. Because the Forest Service would close areas where ground-based logging equipment is operating, most people would not hear noise from heavy equipment.

The noise from light trucks of people collecting firewood would be minimal. Using the assumptions from the traffic analysis report, we expect an extra 14 trucks per day on Forest Road 263, or two per hour. On Forest Road 156, we expect 23 project-related light trucks per day, or about three per hour. Considering that about 700 trucks per day travel currently on Forest Road 263, this would be an increase of five percent per day. A busy city street is about 90 decibels, so the noise from project-related light trucks is estimated to be in the neighborhood of 50-60 decibels. This noise would be limited in duration and extent because firewood areas would be open no more than 120 days per year, and only one area (200-400 acres) would be open at a time.

- **Safety:** Because the Forest Service would close areas in which it is working, public safety would not be jeopardized during thinning or prescribed burning since people would not be allowed in the area. Not working around recreational residences or around Calf Canyon from Memorial Day to Labor Day and providing advance notice of planned work would nearly eliminate the risk of injury to the public. There is an increased risk of automobile accidents during firewood collection since more vehicles would be on the road, but it is difficult to quantify this risk. Because the Forest Service would halt prescribed burning before smoke settles and accumulates over roads, the risk of automobile accidents from reduced visibility would be very small. Few people would have respiratory difficulties due to smoke since most prescribed burning would occur far from people or when people were not present.
- **Environmental Justice:** The Proposed Action would improve the environmental conditions of nearby communities because it would reduce the chance that a large, resource-damaging fire would sweep through the area and destroy homes.

Direct/Indirect Effects of Alternative 3 – More Thinning:

- **Economic Impacts:** The effects of Alternative 3 on income and poverty levels of Las Vegas and San Miguel County would be the same as for the Proposed Action because the number of workers required would be about the same. The main difference is the helicopter yarding operation, which would likely be from out of town, so no local workers would benefit.

  Alternative 3 would provide about 61,000 cords of wood to the public over five years. This would be a substantial increase from what is available currently, and would provide a reliable supply of wood for five years or more.
- **Cost-Benefit Analysis:** Treatment costs may range from $100 to $900 per acre (Romero, pers. comm.). This project would not pay for itself since most of the wood removed would be small in diameter, and the Forest Service would have to pay to have trees thinned and removed. The benefits associated with the Proposed Action would be: reduced risk of large, high-severity wildfire, a steady and plentiful supply of firewood and vigas, better scenic views, reduced risk of water contamination from ash and sediment, and reduced costs when compared to suppression costs.

- **Noise:** The sources of noise for Alternative 3 would be similar to the Proposed Action, except it would also have noise from helicopters. A helicopter yarding operation would last approximately three months, so the noise would be limited in duration but relatively constant during that time. Further, helicopters are not allowed to fly over residences or recreational sites, limiting the amount of noise heard at those sites.

  Alternative 3 would require the greatest number of trucks to remove wood products, so it would also have the most noise from traffic. Using the same assumptions as in the traffic report, about 49 light trucks per day would travel on Forest Road 263, three and a half times as many as for the Proposed Action, or about seven per hour. On Forest Road 156, about 54 per day are expected, also about seven per hour. This noise would be limited in duration and extent because firewood areas would be open no more than 120 days per year, and only one area (200-400 acres) would be open at a time.
- **Safety:** The risk to public safety would be the same as described for the Proposed Action.
- **Environmental Justice:** Some short-term noise from helicopter operations might disturb residents. Otherwise, the effects would be the same as for the Proposed Action.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning:

- **Economic Impacts:** Alternative 4 would not affect income and poverty levels of Las Vegas and San Miguel County because no additional workers would be needed – the Forest Service would be able to complete the project with its own workforce.

  Alternative 4 would provide about 20,000 cords of wood to the public over five years. This would be a substantial increase from what is available currently, and would provide a reliable supply of wood for five years or more.
- **Cost-Benefit Analysis:** Treatment costs may range from $100 to $900 per acre (Romero, pers. comm.). This project would not pay for itself since most of the wood removed would be small in diameter, and the Forest Service would have to pay to have trees thinned and removed. The benefits associated with the Proposed Action would be: reduced risk of large, high-severity wildfire, a steady and plentiful supply of firewood and vigas, better scenic views, reduced risk of water contamination from ash and sediment, and reduced costs when compared to suppression costs.
- **Noise:** The amount and kinds of noise from Alternative 4 would be the same as for the Proposed Action.
- **Safety:** The risk to public safety would be the same as described for the Proposed Action.
- **Environmental Justice:** The effects would be the same as for the Proposed Action.

Cumulative Effects to Social: Because none of the action alternatives would drastically alter the county's income, there would be no cumulative effect. Any of the action alternatives could increase the number of workers in the forestry field, possibly cumulatively adding to other jobs created in that field by state or private entities. All the action alternatives would cumulatively add to the supply of wood currently being supplied by the Forest Service and the State of New Mexico. Because the noise associated with all the action alternatives would be limited in extent

and duration, it is unlikely there would be other projects causing cumulative effects at the same time and place. Because there would be no change in safety from any of the action alternatives, there would be no cumulative effects. Environmental justice would be improved by any of the action alternatives; we are not aware of other projects that would cumulatively contribute to improving environmental conditions around the project area.

Wildlife – Affected Environment

This section evaluates the effects of the project to threatened or endangered species (T&E), species proposed for the T&E list, sensitive species, MIS species, migratory birds, and their habitats. The information in this section is summarized from the wildlife specialist's report located in the project record. All the action alternatives are consistent with Forest Plan standards and guidelines for wildlife.

Federally Listed Species

Five federally-listed species were considered because habitat for them could exist on the Santa Fe National Forest; four were excluded from this analysis for the following reasons:

- Bald Eagle (*Haliaeetus leucocephalus*), Threatened - Bald eagles may use the project area occasionally for foraging, but nesting and roosting habitat does not exist in it. (W. Britton, pers. comm.)
- Black-footed Ferret (*Mustela nigripes*), Endangered - The black-footed ferret is a prairie dog-obligate species and only lives near prairie dog towns. Grasslands with prairie dog towns do not exist in the project area.
- Holy Ghost Ipomopsis (*Ipomopsis sancti-spiritus*), Endangered - The only population of the Holy Ghost Ipomopsis is located well outside the project area, approximately 8 miles west in Holy Ghost Canyon.
- Southwestern Willow Flycatcher (*Empidonax traillii extimus*), Endangered – Riparian habitat, such as wide floodplains, dense willows, and cottonwood overstory, necessary for flycatcher habitat, does not exist in the project area.

The following species is evaluated below:

Mexican Spotted Owl (MSO), *Strix occidentalis lucida*, Threatened

The MSO's nesting and roosting habitat is characterized by steep topography, cool shady canyons, and mature mixed conifer forest having high canopy closure. Protected Activity Centers (PACs) are established to protect territories of individual MSO. Owls also use ponderosa pine and other vegetation types for foraging. Forest-wide, there are 303,063 acres of MSO mixed conifer habitat (MIS report 2002). Within the project boundary there are 9,675 acres of mixed conifer habitat.

The Forest Service conducted two consecutive years (2001, 2002) of monitoring according to protocol. PACs have been monitored in other years as well (Table 18). Outside of PACs, no owls responded in 2001. There were two vocal responses at night outside of PACs in 2002; however, there were no responses during follow-up surveys in the daytime, and no nests or roosts were located.

Three PACs would be affected by the proposed project. Two of these, El Cielo and Gallinas, lie completely within the Gallinas Municipal Watershed. The third, Carreton, is outside of the watershed; however, an important fuelbreak associated with the project would pass through the PAC.

Table 18. Protected Activity Centers in the project area

PAC Name	Acres	Year Established	Primary Vegetation Type	Years Monitored
Carreton	590	1992	Mixed conifer/ponderosa pine	92-94, 98, 99, 02
Gallinas	814	1997	Mixed conifer	98, 01, 02
El Cielo	779	2001	Mixed conifer	01, 02

Carreton (USGS El Porvenir 7 ½ minute quadrangle, S. 15, 21, 22, 23) contains upper Carreton Canyon and tributaries, and is bisected by Forest Road 156. Johnson Mesa is to the west and the national forest boundary is to the east. Existing vegetation consists of mixed conifer and ponderosa pine.

Gallinas (USGS El Porvenir 7 ½ minute quadrangle, S. 9, 10, 15, 16) is bisected by Gallinas Creek and Forest Road 263, and lies between Baker Flat and Oak Flat picnic areas to the east and Johnson Mesa and Big Pine picnic area to the west. Existing vegetation is primarily mixed conifer, with a small component of oak woodland.

El Cielo (USGS El Porvenir 7 ½ minute quadrangle, S. 4, 9, 5, 33) is bounded by Young's Canyon to the west, and El Cielo Mountain and private land to the east. The PAC contains several tributaries of Gallinas Creek. Existing vegetation is primarily mixed conifer, with small components of oak and aspen.

Mexican Spotted Owl – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: Since no management activities would occur, no MSO would be directly disturbed. Habitat would not be altered directly, since no trees or other habitat elements such as nests, roosts, snags or logs would be removed or burned. Forest health, however, would continue to decline as trees compete for light and nutrients, trees remain too small, stands cannot move toward old growth, and grass, forbs and shrubs which provide cover for prey would be crowded out. These stands would gradually lose suitability as habitat for the MSO and habitat suitability would be reduced.

No Action with Wildfire: The effects of a high severity wildfire could affect MSO directly through mortality, especially of young, and indirectly through habitat alteration. Most fires in Region 3 occur during the spring breeding season, when unfledged young are at risk. Although adult MSO can escape a fire, they may choose to take refuge in unburned or lightly burned areas within their defended territory rather than abandoning it (Pecos and Espanola districts 2001-2002 monitoring results). In these cases, MSO are more vulnerable to starvation, predation, or reproductive failure because their territory has lost much of its canopy cover and prey habitat.

The MSO Recovery Plan recognizes wildfire as the primary threat to MSO in the Southern Rocky Mountains-New Mexico Recovery Unit (USDI 1995, p. 100). Recent wildfires (Dome 1996,

Viveash and Cerro Grande 2000) have burned 12 of the 46 PACs on the Santa Fe National Forest, and many of these burned PACs no longer provide suitable MSO habitat. (USDA, MIS report 2002, p. 61). Ponderosa pine and mixed conifer communities can take 100 to 200 years to recover. Small prey may be displaced or killed by fire or smoke. Wildfire suppression would be highly disturbing to MSO and prey, due to heavy equipment, construction of fire lines, slurry and water drops, large numbers of personnel, camps, and helicopter and airplane noise. Several years after a fire, habitat for many prey species may improve as grass, forbs and shrubs recover in the burned areas.

Direct/Indirect Effects of Alternative 2 – Proposed Action: The Proposed Action would treat 5,025 acres of mixed conifer habitat. Table 19 shows how many acres in each PAC would be treated.

Table 19. Acres in PACs proposed for treatment under Alternative 2

PAC name	Total Acres	Acres Proposed for Treatment	Percent of PAC Proposed for Treatment
Carreton	590	143	24
Gallinas	814	197	24
El Cielo	779	150	19

Inside of PACs, by following restrictions for timing, type, and location of treatments (see Mitigations in Chapter 2), the Proposed Action would not affect the MSO. The biological assessment for the area makes a “may affect, not likely to significantly affect” determination for the project. This means that any anticipated effects from the project are expected to be discountable. No treatment would occur in the 100-acre nesting center of each PAC. By not permitting treatments in PACs during the breeding season, breeding would continue unharmed. Outside of the breeding season in PACs, smoke, fire, and heat from prescribed burning could disturb the MSO up to seven days. Also, noise from thinning could disturb the MSO for up to two weeks. Outside of PACs, in protected and restricted habitat, treatments would occur year-round as weather permits and within limitations set by the Forest Plan. Noise from thinning may disturb individual owls for about two weeks. Smoke, fire, and heat could disturb the owl for up to seven days during prescribed burning. When firewood is collected from Forest Road 156, intentional or unintentional disturbance from humans may occur for approximately two months.

The Proposed Action would provide long-term protection to MSO habitat by reducing the risk of crown fire initiation and spread. Treatment would encourage growth of grass, forbs, and shrubs that provides food and cover for the MSO’s prey. Torching of individual trees could kill or damage potential nest or roost trees, but these trees would then provide future ecological value as snags and logs. Most existing habitat elements such as logs, snags, and large trees would be retained, and the overall forest structure that the MSO depend on would not be changed.

Direct/Indirect Effects of Alternative 3 – More Thinning: Alternative 3 would treat 5,717 acres of mixed conifer habitat. Table 20 shows how many acres in each PAC would be treated.

Helicopters removing wood products may flush but would not force relocation of MSO. Delaney et al (1999) showed that MSO flushed by helicopter noise returned to pre-disturbance behavior within 10 to

Table 20. Acres in PACs proposed for treatment under Alternative 3

PAC Name	Total Acres	Acres Proposed for Treatment	Percent of PAC Proposed for Treatment
Carreton	590	206	35
Gallinas	814	199	24
El Cielo	779	159	20

15 minutes, and did not flush at all during the nestling stage. It is very important to the survival of young that the adults do not flush while nesting. Alternative 3 would thin an addition 2,700 acres interspersed with protected habitat, where treatment is permitted year-round (Forest Plan and MSO Recovery Plan).

Otherwise, the effects to MSO would be the same as that of the Proposed Action.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning:
Alternative 4 would treat 1,874 acres of mixed conifer habitat. Table 21 shows how many acres in each PAC would be treated.

Table 21. Acres in PACs proposed for treatment under Alternative 4.

PAC Name	Total Acres	Acres Proposed for Treatment	Percent of PAC Proposed for Treatment
Carreton	590	183	31
Gallinas	814	140	17
El Cielo	779	20	3

Inside of and outside of PACs, the effects would be the same as for the Proposed Action.

Alternative 4 would provide some long-term protection to MSO habitat by reducing the risk of crown fire initiation and spread. Since it treats only about 25 percent of the project area, however, it would not protect habitat as well as the other alternatives. Further, it would only marginally increase potential habitat for the MSO's prey.

Cumulative Effects to the Mexican Spotted Owl: The geographic bounds for the analysis of cumulative effects to the MSO is the wilderness boundary to the north, the forest boundary to the south, the Viveash burn to the west, and the forest boundary to the east because this area defines a contiguous management area containing MSO habitat.

None of the action alternatives would change the habitat suitability for the MSO, so there would be no cumulative effects. All of the action alternatives would help protect MSO habitat from high-severity crown fire. Cumulatively with other fuels reduction projects (319 grants and Road 18), MSO habitat would be better protected from wildfire for about 10 to 20 years, until new seedlings grow tall enough to become ladder fuels. The Road 18 habitat improvement project/timber sale and the 319 grant projects will be complete before this project commences, so direct disturbance, such as noise, smoke, or heat, to the MSO would not overlap.

No Action with wildfire cumulatively would cause a loss of habitat and a reduction in the number of MSO that the area could support. The Viveash Fire heavily impacted or destroyed 4 PACs; a wildfire in the watershed could eliminate up to three more PACs and other potential habitat.

Sensitive Species

The Regional Forester's Sensitive Species list (7/99) and the U.S. Fish and Wildlife Service Candidate Notice of Review (July 2002) identifies fifteen sensitive species on the Santa Fe National Forest. Of those, only the Northern goshawk, Peregrine falcon and Hairless (Pecos) fleabane occur in the project area and are evaluated below. The Rio Grande cutthroat trout is evaluated in the Fish section that follows.

Northern Goshawk, *Accipiter gentilis*

The northern goshawk in the Southwest occurs mainly in ponderosa pine forests, but also in mixed-conifer and spruce-fir. Foraging habitat consists of a mosaic of forest clearings, densely forested areas, and relatively open areas with grasses, forbs and shrubs. Nest areas are stands with large trees and relatively high canopy cover of 50 percent or higher (Reynolds 1992, p. 14).

The project area was surveyed for goshawks in May 2003 and none were found.

The forest establishes a post-fledgling area (PFA) and foraging area (GFA) around each goshawk nesting site. There are no PFAs or GFAs in the Gallinas Watershed. The Forest Plan (Appendix D, p. 8-9) specifies the average canopy cover needed to promote goshawk habitat in vegetative structural stages (VSS) 4, 5, and 6. VSS 4 is mid-aged forest, VSS 5 is mature forest, and VSS 6 is old growth forest (see Table 22). The Forest Plan does not have canopy cover requirements for VSS 1, 2, or 3.

The proposed project area does not currently contain high quality goshawk habitat. Nearly all of the proposed treatment area consists of dense stands of small trees in the VSS 3 class. Several VSS 4 stands exist within the proposed treatment areas; treatment in these stands would be modified to meet the canopy cover requirements given in the Forest Plan (see Table 22). There is no VSS 5 or 6 stands.

Table 22. Minimum stand average canopy cover required for goshawk

	Outside PFA*	
	Mixed Conifer	Ponderosa Pine
VSS 4 (mid-aged forest)	1/3 = 60% 2/3 = 40%	40%

Northern Goshawk – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: The current stand conditions do not provide optimal habitat for goshawk prey. Whereas the goshawk prefers mid-aged and older forests, the project area consists of almost exclusively young forest (VSS 2 and 3). Without disturbance, stands would be unable to progress toward mature forest with large trees, and suitable habitat for goshawk would not develop. Since no goshawks are located in the proposed project area, no individuals would be affected.

No Action with Wildfire: Since no goshawks are located in the project area, no individuals would be affected. A severe wildfire would kill all vegetation in the path of the fire, eliminating potential goshawk nesting habitat for 100 to 200 years. Habitat for prey may improve as grass,

forbs and shrubs develop in the burned areas (see Migratory Birds evaluation), increasing goshawk foraging potential.

Direct/Indirect Effects of Alternative 2 – Proposed Action: Since no goshawks are located in the project area, no individuals would be affected. The Proposed Action would help produce the habitat preferred by goshawks. By removing small trees from the VSS 3 class, more VSS 4 would be created immediately because the larger trees in the stand would be left (see Fire, Fuels, and Vegetation section). These trees would mature, while grass, forbs and shrubs would develop, eventually providing suitable habitat for goshawks and their prey.

Direct/Indirect Effects of Alternative 3 – More Thinning: Since no goshawks are located in the project area, no individuals would be affected. Alternative 3 would help produce the habitat preferred by goshawks (see effects described under the Proposed Action above).

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Since no goshawks are located in the project area, no individuals would be affected. Alternative 4 would not produce any measurable increase in the amount of goshawk habitat. It would, however, provide some protection of the project area from a high-severity wildfire.

Cumulative Effects to Northern Goshawk: The geographic bounds for the analysis of cumulative effects to the northern goshawk is the Sapello River and wilderness boundary to the north, the fourth standard parallel (near Rito Jaroso) to the south, the project boundary to the west, and the forest boundary to the east because this area contains habitat, potential habitat, and several post-fledgling areas.

Because no individuals inhabit the project area, there would be no cumulative effect to the goshawk population from this project. The overall effect from any of the action alternatives would be to increase potential goshawk habitat over time, cumulatively adding to that created by other nearby thinning projects (Maestas, Road 18, and 319 projects).

Peregrine Falcon, *Falco peregrinus anatum*

The peregrine falcon lives at 6,500 to 9,000 feet in mixed conifer, ponderosa pine, and spruce-fir. They nest on high cliffs near water, and forage over a very large area. A nesting cliff site exists adjacent to but outside the project area. There are no other suitable nesting cliffs in the project area.

Under the Interagency Agreement (USDA, et. al., 1991) and Forest Plan (pp. 62-63) for the peregrine falcon, a site plan has been developed for nesting areas. Protective zones of sensitivity (A-D) are established in roughly concentric circles around these areas. The A Zone is closest to the nesting cliff and, therefore, the most sensitive, and the outermost D Zone the least sensitive. For the Pecos Wilderness site, no part of the A Zone falls in a treatment area; some portions of the B, C, and D sensitive zones fall within the proposed treatment areas depending on the alternative. The site management plan describes acceptable levels of noise disturbance and opening dates for people, machinery, and aircraft in each sensitivity zone (see Mitigations and Monitoring in Chapter 2).

Peregrine Falcon – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: There would be no disturbance to individual birds from management activities. Habitat for the peregrine falcon would not change. The current stand conditions do not provide optimal habitat for its prey; however, falcons forage over a wide area and are not limited to foraging within the project area.

No Action with Wildfire: A severe wildfire and fire suppression activities may temporarily flush or relocate falcons for the duration of the fire. If the fire occurs during the breeding season, there is a risk that nestlings would die due to adults being flushed from the nest. A nest failure would not cause falcons to abandon the aerie and they would most likely attempt to nest the following year. Prey may be displaced or killed by fire or smoke; however, falcons forage over a wide area and would be able to find food outside the burned area. Habitat for many prey species may improve as grass, forbs, and shrubs develop in the burned areas.

Direct/Indirect Effects of Alternative 2 – Proposed Action: The number of acres of each sensitive zone falling in the Proposed Action is shown in Table 23.

Table 23. Acres in sensitive zones proposed for treatment under Alternative 2.

Zone	Total Acres in Zone	Acres Proposed for Treatment	Percent Proposed for Treatment
A	3,926	0	0
B	1,776	261	15
C	3,303	684	21
D	6,003	783	13

By following the noise restriction standards (see Mitigation and Monitoring section and Forest Plan p. 63), peregrine falcons would not be disturbed. The Proposed Action would not change the falcon's cliff habitat, and would only affect part of its total foraging habitat on the forest. Prey birds may be displaced or killed by fire or smoke; however, falcons forage over a wide area and would be able to find food outside the project area. Habitat for many prey species would improve as grass, forbs and shrubs develop in the treated areas. Thus, the Proposed Action would not impact the suitability of the area for the peregrine falcon.

Direct/Indirect Effects of Alternative 3 – More Thinning: The number of acres of each sensitive zone falling in Alternative 3 is shown in Table 24.

Table 24. Acres in sensitive zones proposed for treatment under Alternative 3.

Zone	Total Acres in Zone	Acres Proposed for Treatment	Percent Proposed for Treatment
A	3,926	0	0
B	1,776	265	15
C	3,303	735	22
D	6,003	975	16

Though Alternative 3 would employ helicopters to yard wood from some units, the D Zone (the outermost and least sensitive zone) is located 2.5 miles east of the proposed helicopter landing and yarding. Helicopter yarding carried out according to the falcon's sensitive zones restrictions would not disturb nesting falcons (see Mitigation and Monitoring section and Forest Plan p. 63). Otherwise, the effects would be the same as that of the Proposed Action.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: The number of acres of each sensitive zone falling in the Proposed Action is shown in Table 25.

Table 25. Acres in sensitive zones proposed for treatment under Alternative 4.

Zone	Total Acres in Zone	Acres Proposed for Treatment	Percent Proposed for Treatment
A	3,926	0	0
B	1,776	23	1
C	3,303	202	6
D	6,003	752	13

By following the noise restriction standards (see Mitigation and Monitoring section and Forest Plan p. 63), peregrine falcons would not be disturbed. The Proposed Action would not change the falcon's cliff habitat, and would only affect part of its total foraging habitat on the forest. Prey birds may be displaced or killed by fire or smoke; however, falcons forage over a wide area and would be able to find food outside the burned area. Habitat for many prey species would improve as grass, forbs and shrubs develop in the burned areas. Thus, the Proposed Action would not impact the suitability of the area for the peregrine falcon.

Cumulative Effects to Peregrine Falcon: None of the action alternatives would change the habitat suitability for the peregrine falcon, so there would be no cumulative effects with other projects or events. All of the action alternatives would help improve habitat for small bird prey, cumulatively with other fuels reduction projects (319 grants and Road 18).

Hairless (Pecos) Fleabane, *Erigeron subglaber*

The largest known population of this plant is located on Elk Mountain just outside the Pecos Wilderness. Other smaller populations occur on the ridge that extends north from Elk Mountain to Spring Mountain, also in the Pecos Wilderness. Conifers are encroaching into the meadow habitats required by the hairless fleabane.

Hairless Fleabane – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: The populations described above would not be directly affected because no treatments would occur where they are located; however, conifers encroaching into meadows would gradually reduce the amount of potential habitat for the hairless fleabane.

No Action with Wildfire: A wildfire is not likely to change the populations or habitat of the hairless fleabane. Fire lines, which can destroy populations, would be constructed to avoid the fleabane and its habitat.

Direct/Indirect Effects of Alternative 2 – Proposed Action: Because the Proposed Action avoids treating in areas with an existing fleabane population, no individual plants would be harmed. The Proposed Action could increase the amount of fleabane habitat in the vicinity of Elk Mountain because it would remove conifers encroaching into natural meadows, thereby protecting existing habitat and possibly expanding potential habitat.

Direct/Indirect Effects of Alternative 3 – More Thinning: Because Alternative 3 avoids treating in areas with an existing fleabane population, no individual plants would be harmed. Alternative 3 could increase the amount of fleabane habitat in the vicinity of Elk Mountain because it would remove conifers encroaching into natural meadows, thereby protecting existing habitat and possibly expanding potential habitat.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Because Alternative 4 avoids treating in areas with an existing fleabane population, no individual plants would be harmed. Alternative 4 could increase the amount of fleabane habitat in the vicinity of Elk Mountain because it would remove conifers encroaching into natural meadows, thereby protecting existing habitat and possibly expanding potential habitat.

Cumulative Effects to the Hairless Fleabane: The geographic bounds for the analysis of cumulative effects to the hairless fleabane is the project area around Elk Mountain and the ridge extending north into the wilderness to Spring Mountain. This area contains the extent of the species population.

Since no individual plants would be affected by any action alternatives, there would be no cumulative effects. The action alternatives could increase habitat. There are no other actions occurring in the project area that would cumulatively increase habitat for the hairless fleabane. The cumulative effect of No Action would be conifer encroachment and habitat loss in all areas of known populations.

Management Indicator Species (MIS)

The habitat that each MIS species represents is presented in Table 26.

Table 26. Management Indicator Species and the habitat type they represent.

Common Name	Habitat Type Represented
Merriam's Turkey	Early seral stage habitat in ponderosa pine which allows for grass, forbs and mast-producing vegetation to grow
Pinyon Jay	Foraging habitat and mast-producing species in pinyon-juniper
Hairy Woodpecker	Maturing forest habitat and snags
Mourning Dove	Grasslands, woodlands and ponderosa pine
Mexican Spotted Owl	Mature and old growth forest
Rocky Mountain Elk	Early seral stage habitat and forage availability
Rocky Mountain Bighorn Sheep	Alpine meadows
Rio Grande Cutthroat Trout	Riparian habitat and water quality

The following MIS species were excluded from this analysis for the following reasons:

- Mexican Spotted Owl - Evaluated in this report under federally listed species
- Pinyon Jay - No pinyon-juniper habitat in project area
- Rocky Mountain Bighorn Sheep - No alpine habitat in project area
- Rio Grande Cutthroat Trout - Evaluated in Fish section

Effects on the remaining five MIS species are evaluated below.

Merriam's Turkey, *Meleagris gallopavo merriami*

Abundant turkey habitat exists in the mid-elevation portions of the Santa Fe National Forest. The bird uses ponderosa pine as a source of mast and as a roosting tree, preferring tall, mature or over-mature ponderosa pines with relatively open crowns and large horizontal branches starting at 20 to 30 feet from the ground. Roosting trees are 14 inches or greater in diameter. These trees must have excellent protection from the wind, and must be located in sites with an open ridge or rocky ledge nearby to provide ease in entering and exiting the roost site. Hens normally nest on the ground within a half mile radius of water. A total of 1,314,113 acres of turkey habitat exist forest-wide; the project area contains approximately 15,000 acres of habitat.

Merriam's Turkey – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: Turkeys would not be disturbed or displaced by management actions. In the proposed treatment areas, the No Action Alternative would lead to a gradual decline in turkey habitat quality and quantity. At present, ponderosa pine stands in proposed treatment areas do not provide optimal turkey habitat because they are mid-aged and younger, and comprised primarily of small trees (see the Fire, Fuels and Vegetation section). Ponderosa pine would continue to be replaced by shade-tolerant species such as white fir, and the grass, forbs and shrubs vegetation shaded out, eliminating cover for turkey nesting.

No Action with Wildfire: In a wildfire, nestlings could be killed, while most adult birds could escape. A high-severity wildfire would destroy roost trees that would take several decades to regenerate, essentially destroying turkey habitat in the near future. Fire suppression activities would be highly disturbing.

Direct/Indirect Effects of Alternative 2 – Proposed Action: Noise, prescribed burning, and smoke from the Proposed Action would displace turkeys for the duration of implementation, about 2 weeks. Since habitat is abundant, they would be able to move elsewhere and the viability of the local turkey population would not be affected. If treatments are conducted during the breeding season, nests could be destroyed inadvertently.

Approximately 8,000 acres of turkey habitat would be treated (0.6 percent of total habitat on the forest), releasing residual ponderosa pine stands to grow larger more quickly and providing better habitat. Further, treatment would protect habitat from high-severity wildfire. Turkeys do not roost on ridge tops, and removal of large trees from fuelbreaks in these areas would not affect the turkey. Removing large trees from other fuelbreaks may eliminate a few roost trees; however there is an abundance of other suitable habitat in the project area. Total acreage of turkey habitat in the project area after treatment would remain the same as pre-treatment (15,000 acres).

Direct/Indirect Effects of Alternative 3 – More Thinning: Noise, prescribed burning, and smoke from Alternative 3 would displace turkeys for the duration of implementation, up to two

weeks at a time in each stand. Since habitat is abundant, they would be able to move elsewhere and the viability of the population would not be affected. If treatments are conducted during the breeding season, nests could be destroyed inadvertently.

Approximately 8,500 acres of turkey habitat would be treated (0.6 percent of the forest), releasing residual ponderosa pine stands to grow larger more quickly and providing better habitat. Further, treatment would protect habitat from high-severity wildfire. Roost trees may be inadvertently removed when creating fuelbreaks. Total acreage of turkey habitat in the project area after treatment would remain the same as pre-treatment (15,000 acres).

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Alternative 4 treats only 3,700 acres (0.3 percent of the forest) of available habitat in the project area. Turkeys would be disturbed or displaced up to 2 weeks at a time primarily by noise, since Alternative 4 has very little broadcast burning. Enough habitat exists that turkeys could move, so the long-term viability of the local population would not be affected. Alternative 4 would not provide good protection from high-severity wildfire. Roost trees may be inadvertently removed when creating fuelbreaks, but enough trees would remain to replace them. Total acreage of turkey habitat in the project area after treatment would remain the same as pre-treatment (15,000 acres).

Cumulative Effects to Merriam's Turkey: The population trend for the Merriam's turkey is rated as stable to slightly increasing at the forest level. Since the action alternatives are expected to have minimal effects on the local turkey population, there would be no changes anticipated in the forest-wide population trend. Turkey habitat is abundant across the Santa Fe National Forest. All the action alternatives would improve existing habitat and protect it from high-severity wildfire, cumulatively adding to those acres from other fuels treatment projects on the forest. Based on these factors, no negative cumulative effects are anticipated.

Rocky Mountain Elk, *Cervis elaphus nelsoni*

Rocky Mountain elk are very common, inhabiting most forest types having good forage and cover. There are 1,624,026 acres of elk habitat forest-wide. Nearly all of the project area (17,000 acres) is suitable elk habitat. Hunting provides the main method of population control. Forage has been reduced over time because of the closed canopy and high density of small trees over much of the project area.

Rocky Mountain Elk – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: There would be no change from the existing condition just described. The amount of forage would continue to decline because trees would remain dense and the canopy closed, limiting growth of grasses, forbs, and shrubs.

No Action with Wildfire: Some individuals may be displaced during a high-severity wildfire. Elk habitat would improve after such a fire. After a fire, grass, forbs and shrubs on which elk forage would quickly grow back, as seen after the Viveash Fire. A large increase in elk population was associated with the 1977 La Mesa Fire, and elk were reportedly unaffected by the Cerro Grande Fire (BAER 2000, p. 391-2).

Direct/Indirect Effects of Alternative 2 – Proposed Action: The Proposed Action may temporarily (up to two weeks) disturb individuals during project implementation. Nearly all of the project area is currently used by elk, so they would easily be able to move to other habitat.

The Proposed Action slates 8,844 acres (0.5 percent forest-wide) of habitat for treatment. Elk habitat would be improved because thinning and underburning would increase the amount of forage. Total acreage of elk habitat in the project area after treatment would remain the same as pre-treatment (17,000 acres).

Direct/Indirect Effects of Alternative 3 – More Thinning: Alternative 3 may temporarily (up to one month) disturb individuals during project implementation. Nearly all of the project area is currently used by elk, so they would easily be able to move to other habitat.

Alternative 3 slates 9,303 acres (0.6 percent forest-wide) of habitat for treatment. Elk habitat would be improved because thinning and underburning would increase the amount of forage. Total acreage of elk habitat in the project area after treatment would remain the same as pre-treatment (17,000 acres).

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Alternative 4 may temporarily (up to one month) disturb individuals during project implementation. Nearly all of the project area is currently used by elk, so they would easily be able to move to other habitat.

Alternative 4 slates 3,611 acres (0.2 percent forest-wide) of habitat for treatment. Elk habitat would be improved because thinning and underburning would promote forage production. A total of 3,611 acres of elk habitat would be treated. Total acreage of elk habitat in the project area after treatment would remain the same as pre-treatment (17,000 acres).

Cumulative Effects to Rocky Mountain Elk: The population trend for the Rocky Mountain elk is ranked as increasing at the forest level. Since the action alternatives are expected to have minimal affects on the local elk population, there would be no changes anticipated in the forest-wide population trend. Elk habitat is abundant across the Santa Fe National Forest. All the action alternatives would improve existing habitat and protect it from high-severity wildfire, cumulatively adding to those acres from other fuels treatment projects on the forest. Based on these factors, no negative cumulative effects are anticipated.

Hairy Woodpecker, *Picoides villosus*

The hairy woodpecker is a forest generalist, keying in on snags and live aspen. It nests in cavities of trees averaging 17 inches in diameter. Downed logs support insect populations, which provide food for the woodpecker. Large trees, which provide future down logs and snags, are maintained across the Santa Fe National Forest in accordance with the Forest Plan. Areas accessible to the public have fewer snags and down logs. In areas inaccessible to the public, snags are maintained at far greater numbers than the Forest Plan guidelines of 2 to 3 snags per acre. Prescribed burning and the Viveash Fire have created large snags in and around the watershed. Forest-wide, 1,395,387 acres are available. Nearly all of the project area (17,000 acres) is potential habitat, depending on the availability of snags and down logs.

Hairy Woodpecker – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: There would be no direct disturbance to woodpeckers inhabiting the project area, and no nesting birds would be disturbed. No habitat would be altered, and important habitat elements such as snags and logs would not be burned or removed.

Long-term habitat deterioration would continue. Trees would remain small as they compete for light and nutrients under an increasingly closed canopy. Snag recruitment would continue but these would be small in diameter. Availability of large nesting and foraging snags would decline. Insect food supplies may increase since overstocked stands are more susceptible to infestation.

No Action with Wildfire: In a wildfire, nestling birds could be killed, while adult birds could escape. Fire suppression activities would be highly disturbing. A severe wildfire could consume entirely important habitat elements like large snags, trees, and downed logs. As seen in the Viveash Fire, however, many snags would be created, increasing the availability of this element of the habitat. Overall, the amount of habitat would not change or would increase.

Direct/Indirect Effects of Alternative 2 – Proposed Action: Noise, prescribed burning, and smoke from the Proposed Action would temporarily (up to two weeks) cause woodpeckers to move away from the area. Activities implemented during the breeding season could disrupt nesting.

A total of 8,733 acres of woodpecker habitat (0.6 percent forest-wide) would be treated. Prescribed burning would consume some downed logs and snags, but also create some; the overall change in the number of snags in the treatment areas would not be large enough to have an effect on habitat availability. Larger trees would develop over the long term (50 to 100 years), increasing the potential to create large snags. Total acreage of woodpecker habitat in the project area after treatment would remain the same as pre-treatment (17,000 acres).

Direct/Indirect Effects of Alternative 3 – More Thinning: Noise, prescribed burning, and smoke from Alternative 3 would temporarily (up to two weeks) cause woodpeckers to move away from the area. Activities implemented during the breeding season could disrupt nesting.

A total of 9,185 acres of woodpecker habitat (0.7 percent forest-wide) would be treated. Prescribed burning would consume some downed logs and snags, but also create some; the overall change in the number of snags in the treatment areas would not be large enough to have an effect on habitat availability. Larger trees would develop over the long term (50 to 100 years), increasing the potential to create large snags. Total acreage of woodpecker habitat after treatment would remain the same as pre-treatment (17,000 acres).

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Only 3,523 acres would be treated (0.3 percent forest-wide). Creating fuelbreaks may necessitate removal of some larger trees or snags, but not enough to affect overall habitat availability. Woodpeckers in treatment units would be disturbed, but could easily move away from activity areas. As with other alternatives, activities conducted during the breeding season could impact nesting. Total acreage of woodpecker habitat after treatment would remain the same as pre-treatment (17,000 acres).

Cumulative Effects to Hairy Woodpecker: The population of hairy woodpeckers is considered stable to increasing on the Santa Fe National Forest. Since the action alternatives are expected have minimal affects on the local hairy woodpecker population, there would be no changes anticipated in the forest-wide population trend. All alternatives would remove and create snags and downed logs, resulting in no measurable gain or loss to habitat. The action alternatives would promote larger snags over the long term than the No Action Alternative. Therefore, there also would be no cumulative effect to the hairy woodpecker's habitat.

Mourning Dove, *Zenaia macroura*

Mourning doves occur in lower elevation, open canopy forests and grasslands, including ponderosa pine, aspen, and piñon-juniper forests with an herbaceous grass, forbs and shrubs throughout the Santa Fe National Forest. Water developments and underburning in ponderosa pine create favorable feeding areas. Forest-wide, there are 989,993 acres of habitat suitable for mourning dove. The project area consists of 2,647 acres of ponderosa pine and 977 acres of grassland (3,624 total acres). Although doves may use the project area, the forest condition is not highly favorable (W. Britton, pers. comm.). Excellent habitat is abundant elsewhere and doves are not dependent on the project area.

Mourning Dove – Environmental Consequences

Direct/Indirect Effects of Alternative 1 – No Action/No Wildfire: There would be no change from the existing condition just described.

No Action with Wildfire: In a wildfire, nestling birds would most likely be killed, while adult birds could escape. A wildfire would increase the amount of suitable habitat by encouraging grasses and forbs on which doves feed. Fire suppression activities would be highly disturbing.

Direct/Indirect Effects of Alternative 2 – Proposed Action: A total of 2,015 acres of ponderosa pine and 110 acres of grassland would be treated. Thinning and burning would create openings and encourage growth of grass, forbs and shrubs, providing more favorable conditions for the mourning doves beginning 1 to 2 years following treatment. Activities implemented during the breeding season could disrupt nesting. Disturbance at other times from noise, burning and smoke would be temporary, lasting only as long as project implementation, and doves would be able to move away from the immediate activity area.

Direct/Indirect Effects of Alternative 3 – More Thinning: A total of 2,108 acres of ponderosa pine and 118 acres of grassland would be treated. Thinning and burning would create openings and encourage growth of grass, forbs and shrubs, providing more favorable conditions for the mourning doves for 1 to 2 years following treatment. Activities implemented during the breeding season could disrupt nesting. Disturbance at other times from noise, burning and smoke would be temporary, lasting only as long as project implementation, and doves would be able to move away from the immediate activity area.

Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: A total of 1,062 acres of ponderosa pine and 88 acres of grassland would be treated. Activities implemented during the breeding season could disrupt nesting. Disturbance at other times from noise, burning and smoke would be temporary, lasting only as long as project implementation, and doves would be able to move away from the immediate activity area.

Cumulative Effects to Mourning Dove: The habitat trend for the mourning dove is considered stable to increasing across the forest. Since the action alternatives are expected to have minimal affects on the local hairy woodpecker population, there would be no changes anticipated in the forest-wide population trend. All the alternatives, except No Action/No Wildfire and Alternative 4, would improve dove habitat, cumulatively adding to the acres created by other fuels reduction projects such as Road 18, Maestas, and the 319 projects. Based on these factors, no negative cumulative effects are anticipated.

Migratory Birds

On January 10, 2001, President Clinton signed Executive Order 13186 placing emphasis on conservation of neotropical migratory birds (NTMBs). The Forest Service, Southwestern Region, currently analyzes impacts to migratory birds by addressing the following: (1) effects to "Highest Priority" species as identified by New Mexico Partners in Flight, (2) effects to Important Bird Areas (IBAs), and (3) effects to important overwintering areas.

New Mexico Partners in Flight considers eight risk factors in identifying conservation priority species: Global Abundance, New Mexico Breeding Abundance, Global Breeding Distribution, New Mexico Breeding Distribution, Threats to Breeding in New Mexico, Importance of New Mexico to Breeding, Global Winter Distribution, and Threats on the Wintering Grounds. Species with the highest risk factors are classified as "highest priority" for conservation action. This evaluation addresses general effects to migratory birds, and specific effects to highest priority species for the main habitat types found in the project area.

All migratory birds and their habitat are protected under the Federal Migratory Bird Treaty Act of 1918.

Spruce/Fir - Highest Priority Species: Boreal Owl and Blue Grouse

Boreal owls occupy cool, shady sites in mature forests and nest in cavities. Blue grouse prefer an open canopied, coniferous forest and nest on the ground. Both species breed generally from April to June.

Mixed Conifer - Highest Priority Species: Dusky Flycatcher**,** Olive-sided Flycatcher, Williamson's Sapsucker, Mexican Spotted Owl (analyzed under Federally Listed Species)**,** and Northern Goshawk (analyzed under Sensitive Species).

Nests may be located in trees (Olive-sided Flycatcher, MSO, northern goshawk), shrubs (Dusky Flycatcher), snags (Williamson's Sapsucker) or on the ground.

Ponderosa Pine Forest - Highest Priority Species: Flammulated Owl, Grace's Warbler**,** Virginia's Warbler, Mexican Spotted Owl (analyzed under Federally Listed Species)**,** and Northern Goshawk (analyzed under Sensitive Species).

With the exception of MSO, highest priority species in this habitat prefer an open canopy forest with an oak shrub component. Nests may be located in cavities (Flammulated owl), trees (MSO, goshawk) or on the ground (Virginia's Warbler).

Important Bird Areas (IBAs)

There is no designated Important Bird Area (IBA) on Santa Fe National Forest land which would be affected by the project. The nearest IBA is Golondrino Mesa and the Chama River Gorge from El Vado to the north end of Abiquiu Reservoir, and the Caja del Rio and the Santa Fe River Canyon below the Caja del Rio; all on the west side of the forest. The project area is in San Miguel County on the east side of the forest. There is no association or important link between the bird communities in the project area and these IBA's.

Overwintering Areas

Important overwintering areas are often large wetlands. The areas recognized on the forest include the Rio Chama and Rio Grande corridor, on the west side of the forest. The Gallinas Watershed is not recognized as an important overwintering area because large numbers of birds, a high diversity of birds, or unique bird species do not overwinter here.

Migratory Birds – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: Habitat for migratory birds would decline as grass, forbs and shrub vegetation, which provides food and shelter, continue to be crowded out, and large trees for nesting decline. Population viability would decline.

No Action with Wildfire: Wildfire would temporarily displace shrub and ground-nesting species until the grass, forbs and shrubs recover, 2 to 3 years after the fire, depending on severity. Nestling mortality would be high, as most Region 3 wildfires occur during the breeding seasons for birds. Wildfire would create snags which support insect populations, which in turn are an important food source for many species. Wildfire suppression activities would be highly disturbing to birds, due to heavy equipment, construction of fire lines, slurry and water drops, large numbers of personnel, camps, helicopters and airplane noise, etc.

Direct/Indirect Effects of Alternative 2 – Proposed Action: Noise, smoke, heat, or habitat alteration could disrupt breeding, roosting, or foraging while the project is implemented, up to two weeks per stand. Although broadcast burning is designed to remain on the ground, occasional torching could kill or damage individual nest or roost trees and snags. Decline of breeding habitat is a major factor in declining populations of migratory birds. Such habitat loss generally occurs with the permanent conversion of land or wetlands to other uses which do not sustain bird populations. There would be no habitat loss with the proposed treatment. Proposed treatment units are patchy and would not fragment or alter habitat enough to force relocation of migratory bird populations over the entire watershed. No clear cutting would be involved. Treated stands would experience a temporary decline in shrub-dependent species until shrubs grow back, and an increase in species preferring an open canopy (Gillihan, 2000). If the project is implemented during the breeding season, some young could be inadvertently killed. If the project is implemented in the fall, most birds would leave the area to escape the disturbance and to locate other food and cover for the weeks that the project occurs. Any loss of individual birds directly due to project activities would be offset by the restoration of the forest habitats upon which migratory birds evolved and depend.

In the high-elevation spruce-fir, treatments could not be implemented until summer due to snowpack. Boreal owl habitat is not included in treatment, and grouse habitat would be improved by opening meadows and canopy. Since there would be no broadcast burning in this habitat, no

nests would be threatened. In mixed conifer and ponderosa pine, most disturbance and mortality would be during the spring and early summer breeding season (if project activities are conducted during this time), particularly to ground- and shrub-nesting species which could be inadvertently injured or killed by prescribed burning or movement of mechanical equipment over the ground. These effects would be less than those occurring from wildfire and suppression activities.

Direct/Indirect Effects of Alternative 3 – More Thinning: Noise, smoke, heat, or habitat alteration could disrupt breeding, roosting, or foraging while the project is implemented, up to two weeks per stand. Although broadcast burning is designed to remain on the ground, occasional torching could kill or damage individual nest or roost trees and snags. Decline of breeding habitat is a major factor in declining populations of migratory birds. Such habitat loss generally occurs with the permanent conversion of land or wetlands to other uses which do not sustain bird populations. There would be no habitat loss with the proposed treatment. Proposed treatment units are patchy and would not fragment or alter habitat enough to force relocation of migratory bird populations over the entire watershed. No clear cutting would be involved. Treated stands would experience a temporary decline in shrub-dependent species until shrubs grow back, and an increase in species preferring an open canopy (Gillihan, 2000). If the project is implemented during the breeding season, some young could be inadvertently killed. If the project is implemented in the fall, most birds would leave the area to escape the disturbance and to locate other food and cover for the weeks that the project occurs. Any loss of individual birds directly due to project activities would be offset by the restoration of the forest habitats upon which migratory birds evolved and depend.

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Direct/Indirect Effects of Alternative 4 – Less Thinning, Less Prescribed Burning: Noise, smoke, heat, or habitat alteration could disrupt breeding, roosting, or foraging while the project is implemented, up to two weeks per stand. Although broadcast burning is designed to remain on the ground, occasional torching could kill or damage individual nest or roost trees and snags. Decline of breeding habitat is a major factor in declining populations of migratory birds. Such habitat loss generally occurs with the permanent conversion of land or wetlands to other uses which do not sustain bird populations. There would be no habitat loss with the proposed treatment. Proposed treatment units are patchy and would not fragment or alter habitat enough to force relocation of migratory bird populations over the entire watershed. No clear cutting would be involved. Treated stands would experience a temporary decline in shrub-dependent species until shrubs grow back, and an increase in species preferring an open canopy (Gillihan, 2000). If the project is implemented during the breeding season, some young could be inadvertently killed. If the project is implemented in the fall, most birds would leave the area to escape the disturbance and to locate other food and cover for the weeks that the project occurs. Any loss of individual birds directly due to project activities would be offset by the restoration of the forest habitats upon which migratory birds evolved and depend.

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There would be less direct disturbance and mortality to birds, and less improvement of habitat.

Cumulative Effects to Migratory Birds: None of the action alternatives would affect the continued viability of migratory bird populations; so there would be no cumulative effects.

Fish – Affected Environment

Riparian habitat along Gallinas Creek is in properly functioning condition (PFC surveys, project record). Stream banks are stable and well vegetated, with the exception of the EV Long Campground and day use areas; vegetation has been trampled by heavy recreational use. Woody vegetation is abundant, providing excellent shading for the stream.

Only brown and rainbow trout have been found in Gallinas Creek; no Rio Grande cutthroat trout (RGCT) have been found (USDA Forest Service Fisheries files). The brown trout is a self-sustaining population. The New Mexico Department of Game and Fish stocks Gallinas Creek with rainbow trout.

Fish – Environmental Consequences

Direct/Indirect Effects of Alternative 1 - No Action/No Wildfire: There would be no change from the existing condition just described.

No Action with Wildfire: A large, high-severity crown fire could drastically reduce or entirely eliminate the fish population. The first year following a fire, water temperatures would increase due to a lack of cover, and water chemistry and food quality would be altered due to sedimentation. Higher water temperatures and a lack of food would render the stream less suitable for trout. A severe wildfire would destabilize normal hydrologic functioning for several years. The self-sustaining population of brown trout would likely be extirpated, and it would be several years before the streams would be suitable for restocking with trout.

Direct/Indirect Effects of All Action Alternatives: None of the action alternatives would cause any measurable effect on the riparian or aquatic ecosystems or fish because the increase in sediment delivery to the stream would not be enough to alter the habitat.

Cumulative Effects to Fish: Because none of the action alternatives would change fish viability or their habitat, there would be no cumulative effects.

Range – Affected Environment

Three range allotments are located within the boundaries of the project area, El Cielo, Youngs Canyon, and Tecolote. Two of these allotments are vacant; El Cielo has been vacant since 1946,

and Youngs Canyon since 1976. The Forest Service does not plan to reopen either allotment. The north boundary of the Tecolote allotment begins at Johnson Mesa; 32 cow-calf pairs are permitted to graze on the allotment from June 1 to December 31 each year.

Range – Environmental Consequences

Direct/Indirect Effects of All Alternatives: None of the alternatives would change the range resource on the El Cielo and Youngs Canyon allotments because no grazing occurs on them, and no grazing in the future is anticipated. On the Tecolote allotment, more grass would be available in treated areas. No change in permitted numbers of cattle is anticipated as a result of any of the action alternatives.

Cumulative Effects to Range: Because none of the action alternatives would affect range, there would be no cumulative effects.

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